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Work Project

MSc Finance

The Domiciliation Decision and Performance – Evidence from the Irish Mutual Fund Industry

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Abstract

This study analyses the performance of mutual funds domiciled and managed in Ireland using a survivorship bias controlled sample of 398 funds from the period 2003 to 2015. Ireland has established a reputation as one of the leading international fund domiciles of choice, offering global fund managers a combination of regulatory, legal and tax advantages. Thus, the main purpose of this analysis is to investigate the largely undocumented relation between fund domicile and eventual performance, ultimately determining whether these country-specific benefits facilitate the generation of risk-adjusted outperformance. In addition, the study investigates whether Irish active mutual funds manage to outperform their passive counterparts. Finally, the acclaimed service expertise of Irish based fund managers is scrutinized, by comparing risk-adjusted returns to that of foreign mutual fund managers. Utilizing both single and multi-factor asset-pricing models, the overall results comprehensively suggest that mutual funds domiciled and managed in Ireland do not have the ability to outperform their benchmark. Whilst the results are in line with most US and European studies that similarly report negative risk-adjusted returns, the magnitude of Irish mutual fund underperformance is particularly striking.

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Chapter 1 Introduction

For more than 20 years, Ireland has established a reputation as one of the leading international domicile of choice for investment funds. With over $2.13 trillion in mutual fund assets domiciled in Ireland, the nation is currently the second largest fund domicile in Europe behind Luxembourg. Regarded as a key strategic location in terms of fund transparency, regulation, cost-efficiency and protection, Ireland attracts over 800 global managers with 18 of the top 20 global asset managers having Irish domiciled funds.

The sustained rise of Irish mutual fund industry has been widely attributed to the adaptation of robust and efficient regulation, as well as the development of a distinguished tax and professional services environment. As one of the first countries to implement the UCITS Directive into its national law, Ireland stands well positioned as a global distributor of investment products and services that are unrivalled in terms of regulatory and, in particular, tax considerations. These are said to reduce fund operational costs considerably. It is reputed that Ireland has the most compelling set of tax advantages out of any European fund jurisdiction. Mutual funds domiciled in Ireland are exempt from Irish tax on their income and gains, as well as Irish value added tax (VAT). In addition, Ireland has one of the most favourable tax treaty networks in the world, with a continuously expanding treaty network including over 60 countries. Finally, Ireland has a well-developed and experienced professional service infrastructure, with specialist legal, tax and accounting skills. With over 13,000 people employed directly in the management and servicing of investment funds, the Irish funds industry has developed a centre of excellence with expertise that spans a wide range of services.[1]

From an academic perspective, several fund characteristics have shown to be integral drivers of mutual fund performance and selection. Characteristics such as age, size, fees and expenses and style have all been investigated as potential determinants of mutual fund performance; Jensen (1968), Grinblatt and Titman (1989), Ippolito (1989), Malkiel (1995), Carhart (1997), Otten and Bams (2002). The analysis of country characteristics, however, remains largely unexploited. Of the studies that do exist, the research has found a number of common characteristics inherent to a particular fund industry's framework which ultimately influences the investment selection/domiciliation decision for mutual fund managers;

[1] irishfunds.ie – *Why Ireland*

Khorana, Servaes and Tufano (2005), Lang and Schäfer (2013). Whist strong legal and regulatory factors have proven to influence fund location, the undocumented relation between fund domicile and eventual performance represents a significant gap in academic research.

This study intends to fill this gap by analysing the performance of mutual funds both domiciled and managed in Ireland. Given Ireland's dramatic rise and recognition as one of the world's most advantageous jurisdictions in which to establish international investment funds, it is surprising to find no comprehensive studies on Irish mutual fund performance. Whilst Ferreira, Keswani, Miguel and Ramos (2013) find that there is a strong positive relation between the performance of mutual funds and a country's level of financial development and strength of its legal institutions, Ireland is not included in their alpha study of 27 countries. Thus, in spite of the aforementioned lower operational costs and legal barriers that come with Ireland's regulatory, tax and infrastructural developments, the purpose of this paper is to question whether these advantages are ultimately passed on to the investor i.e. do mutual funds, on average, generate risk-adjusted returns above their respective benchmarks in the Irish mutual fund industry? At an investor level, do the associated benefits of holding an equity mutual fund registered in Ireland facilitate the generation of alpha accordingly?

These key questions formulate the primary hypotheses of this study, which intends to provide an innovative investigation into the performance of mutual funds that are both domiciled and managed in Ireland from 2003 to 2015. Next to this, the study also intends to contribute to the active versus passive management debate by analysing whether active mutual funds manage to outperform their passive counterparts. Proponents of market efficiency are likely support passive investing strategies while active investors point to superior performance in certain markets such as mid-cap value, foreign and emerging as a justification for the higher fees charged. These conflicting perspectives will be evaluated thoroughly in the main results of the study. Finally, the renowned skillset and service expertise of Irish based fund managers will be scrutinized, by comparing risk-adjusted returns to that of foreign mutual fund managers, whose funds are domiciled in Ireland. Using a matched sample of equity mutual funds that are domiciled yet managed outside of Ireland, a clearer distinction can be drawn between Irish fund managers and their global counterparts. To this end, the following set of testable hypothesis are developed in addressing the aforementioned research questions;

$H1_0$: *Mutual funds domiciled and managed in Ireland have the ability to outperform their benchmark*

$H2_0$: *There is a relationship between active management and superior risk adjusted returns relative to passive management in the Irish mutual fund industry*

$H3_0$: *Irish based mutual fund managers do generate superior risk adjusted returns relative to the rest of the world*

The remainder of this study is organized as follows. A literature review of empirical studies related to this thesis is presented in Chapter 2. Chapter 3 gives an overview of the global mutual fund industry, with a particular focus on the size and growth of the Irish mutual fund market. The main hypotheses, as well as the methodology used to investigate each hypothesis, are described in Chapter 4. Chapter 5 describes the Bloomberg LP dataset utilized in this study as well as the corresponding summary and benchmark statistics. A cross-sectional analysis is provided in Chapter 6, summarizing the different characteristics of the mutual fund sample in terms of fee structure, average net asset values and manager location. Chapter 7 presents the empirical results of risk-adjusted mutual fund performance and several robustness tests to validate the findings. Chapter 8 concludes the study.

Chapter 2 Literature Review

In light of the considerable growth and expansion of the global mutual fund industry over the past number of decades, it is not surprising to find the scope of research on mutual fund performance increase concurrently. This is especially the case for the European mutual fund market, which has seen a remarkable upsurge in recent research as the industry continues to increase in size, as will be illustrated in Chapter 3. In spite of this rise from a European perspective, academic literature on the performance of mutual funds remains dominated by U.S. studies, which has evolved in terms of measurement approach and data since the 1960s with the development of the Capital Asset Pricing Model (CAPM) by Sharpe (1964) and Lintner (1965). In addition, existing literature on the impact of a fund's domiciliation decision on performance is surprisingly narrow. The following sections of this chapter therefore intend to provide a thorough review of existing literature on U.S. and European mutual fund performance studies, as well as a discussion on the proponents for and against an active fund management style. Finally, existing literature surrounding the fund domiciliation decision and the subsequent disparity in size of mutual fund markets around the world as a result of this decision will be presented.

2.1 Average U.S. Mutual Fund Performance

Much of the extensive literature on mutual fund performance in the United States to date conclude that the net performance of mutual funds is inferior to that of a comparable market benchmark. One of the earliest studies testing for performance was by Jensen (1968), who derived a risk-adjusted measure of portfolio performance – also referred to as Jensen's Alpha – that estimates how much a manger's forecasting ability contributes to the fund's returns. Jensen's Alpha is the return generated in excess of that caused by the portfolio's exposure to risk factors. Using a sample of 115 mutual funds from 1945 – 1964, Jensen's findings indicate that mutual funds were *on average* not able to outperform their passive buy-the-market-and-hold counterparts, holding for both net and gross returns. Jensen also finds that there is very little evidence that any individual fund was able to do significantly better than that which one would expect from mere random chance.

Sharpe (1966) corroborates the above findings of Michael Jensen, using a new measure that evaluates the performance of 34 open-end mutual funds from 1954 – 1963. This measure, known universally as the Sharpe ratio, is used to calculate the average return earned on an investment in excess of the risk-free rate per unit of volatility or total risk. Comparing the mutual fund performance via the Sharpe ratio with the Dow Jones Industrial Average, the reward per unit of risk was 0.663 versus 0.667. This result supports the view that the capital markets is efficient and fund managers should subsequently focus their attention on evaluating risk and providing diversification instead of spending time and money searching for incorrectly priced securities.

The articles by Jensen (1968) and Sharpe (1966) have stood the test of time. Despite their widely acclaimed findings, the aforementioned studies continue to invigorate further research, and in some cases contradict the authors' final results. Grinblatt and Titman (1989) and Ippolito (1989) found mutual funds did possess sufficient private information to offset the expenses they incurred. Using quarterly data from 1975 – 1984 on a sample of 279 funds, Griblatt and Titman find evidence for a positive risk-adjusted alpha, particularly among growth funds and funds with the smallest net asset values. Similarly, Ippolito finds evidence that mutual funds, net of all fees and expenses (except load charges) outperformed index funds on a risk-adjusted basis[2] using a sample of 143 mutual funds from the period 1965 to 1984.

Kosowski et-al (2006) apply a bootstrap statistical technique to examine the performance of the U.S. open-end, domestic-equity mutual fund industry over the 1975 to 2002 period. Despite reporting that the average active mutual fund underperforms its benchmark with an alpha between -0.5 and -0.4 percent per year, their findings indicate that the performance of the "best" and "worst" fund managers is not solely due to luck. In sum, the superior alpha of the best managers does persist.

Finally, Bollen and Busse (2001) rank US mutual funds quarterly by abnormal return and measure the performance of each decile the following quarter. They find that the average abnormal return of the top decile in the post-ranking quarter is 39 basis points however this return disappears when funds are evaluated over longer periods. Such findings on short-term performance persistence are also confirmed by Goetzmann and Ibbotson (1994) and Brown and Goetzmann (1995).

[2] Positive abnormal returns of 81 basis points per annum – Ippolito (1989)

Carhart (1997) however, who also finds evidence of equity mutual fund performance persistence, is not of the opinion that abnormal returns are attributable to the fund manager's stock picking ability or skill. Carhart argues that the "hot-hands" effect i.e. persistence in fund return, is mainly attributable to simple momentum strategies and not to superior fund management i.e. best performing funds have a larger exposure to the best performing stocks in their portfolio in the following year. Carhart also finds that after controlling for the correlation between expenses and loads, and removing the worst-performing quintile of funds, the average load fund underperforms the average no-load fund by approximately 80 basis points per annum.

Another author to criticize the findings of existing literature is Burton Malkiel. Using a large data set from 1971 – 1991, Malkiel (1995) analyses U.S. mutual fund performance with strict consideration of live as well as dead funds. The author claims that most of the older studies, especially Grinblatt and Titman (1989) are subject to survivorship bias, whereby dead (inactive, merged or liquidated) funds are not included in the final dataset for analysis. Consistent with the two earliest studies by Jensen and Sharpe, Malkiel's survivorship bias-free study shows that equity mutual funds underperformed benchmark portfolios both after management expenses and gross of expenses.

2.2 Average European Mutual Fund Performance

On the balance, the general finding from the majority of research on U.S. mutual fund performance is that fund managers are not able to beat the market after fees. This finding is partly attributed to the global dominance and size of the U.S. mutual funds industry i.e. as the market grows in size and importance, opportunities to beat the market become inextricably limited. Does this finding hold for Europe? It can be asserted that the number of comprehensive studies on European mutual fund performance remains relatively narrow, a surprising finding given the tremendous rise in the European mutual fund industry in recent decades. Of the literature that does exist, the results are both consistent and inconsistent with the findings of the U.S. mutual funds, with a number of notable differences between the two largest industries in the world today.

Whilst U.S. mutual fund literature stems back to the 1960s, the first comprehensive study on European mutual fund performance was in 1999 by Grünbichler and Pleschiutschnig. They

investigate performance persistence by looking at a sample covering 333 European equity funds domiciled in various European countries. Their results show that persistence in risk-adjusted returns is present in funds with investment objective European equity. Furthermore, the authors demonstrate that persistence is neither caused by Fama & French (1996) related anomalies nor disappears if corrected for the European momentum effect.

Another major study which focuses on the greatly unexploited topic of European mutual fund performance is by Otten and Bams (2002). Like Grünbichler and Pleschiutschnig (1999), the authors study the performance of 506 equity mutual funds from several countries (France, Germany, Italy, the Netherlands and the UK, to be precise). Applying an unconditional and conditional version of the Carhart (1997) 4-factor model Otten and Bams' performance analysis documents a number of insightful results and also discrepancies between the European and US mutual fund market.

Firstly, the results reveal a preference of European funds for small and high book-to-market stocks. Secondly, it is found that small cap mutual funds as an investment style outperform their benchmark, even after adjusting for size, book-to-market and short-term return momentum factors. Finally, mutual funds in four out of the five countries deliver positive risk-adjusted alphas, where only UK funds out-perform significantly. This finding becomes even more compelling with management costs added back, fees which considerably influence the return available to investors. The authors show that French, Italian, Dutch and UK funds significantly outperform the market, while German funds underperform, albeit non-significantly. Contrary to most US evidence, this result signifies that mutual funds in Europe are more proficient in identifying and implanting new information to offset their expenses, and hence add value for the investor.

The aforementioned findings are subsequently revisited in Otten and Thevissen (2011). This recent study aims to tackle the question addressed in the introduction to this section, examining whether the increasing size of the European mutual fund industry has had an impact on the ability of European mutual funds to beat the market – as demonstrated in the inaugural study. Using a more up-to-date and extensive survivorship bias free sample of 16,055 funds from 1992 to 2006, the authors find that European mutual funds deliver significantly negative Carhart 4-factor alphas. This is a striking result given the positive risk-adjusted alphas recorded in Otten and Bams (2002), which already includes 8 years[3] of

[3] Otten and Bams (2002) sample period is 1991 - 1998

sample period in question. The authors conclude that the results are more in line with earlier studies found in US literature, with the larger current size of the European mutual fund industry making it more difficult for fund managers to add value.

As mentioned in the Introduction to this paper, the lack of empirical research conducted on the Irish mutual fund industry is one of the primary motivations and contributions of this research. Whilst the three comprehensive studies reviewed thus far focus on a broader European sample, several authors have analysed mutual fund performance for individual countries.

For UK data on mutual funds, there is little evidence of superior mutual fund performance. Fletcher and Forbes (2002), show that the significant persistence they find in UK unit trust funds between 1982 and 1996 is driven by repeated underperformance. Blake and Timmermann (1998) similarly report persistence of underperformance on a risk-adjusted basis and the existence of a substantial survivorship-bias in the UK mutual fund market. Cuthbertson, Nitzsche and O'Sullivan (2008) however find contrasting results. Using a comprehensive data set of UK equity mutual funds from 1975 – 2002 and applying a cross-sectional bootstrap methodology to distinguish between "skill" and "luck" for individual funds, the study points to the existence of stock picking ability among a relatively small number of top performing UK equity mutual funds. Additionally, the analysis for the worst performing funds strongly rejects the hypothesis that most poor funds are merely "unlucky", rather these funds demonstrate "bad skill".

The German mutual fund market is analysed in a study by Bessler, Drobetz and Zimmermann (2009). Applying a beta-pricing approach and the stochastic discount factor (SDF), they find that German mutual funds, on average, do not produce returns that are large enough to cover their expenses. Dermine and Roller (1992) report that economies and scope exist in French money market mutual funds i.e. investment performance improves as assets under management increase in size. Lastly, Białkowski and Otten (2011) provide evidence on the performance of mutual funds in Poland, a country that, like Ireland, has experienced a sizeable increase in fund total net assets in recent years. Using a survivorship controlled sample of 140 mutual funds over the 2000 – 2008 period, the paper finds that Polish funds underperform their relevant benchmarks, and persistence in performance is evident.

2.3 Active vs Passive Fund Management – Which is Better?

Ever since the formation of passively styled investment strategies, there has been an endless debate about their merits versus active management. Leaving management fees, transparency, hedging and tax efficiency attributes to one side, this debate specifically centres on the question of which investment approach offers better returns to the investor. Active investing is an asset allocation strategy with high relative frictions that attempts to beat the market return on a risk-adjusted basis. The majority of literature discussed in the two previous sections demonstrate that active mutual fund managers are not able to generate a risk-adjusted return to cover and certainly justify the fees that are charged. Passive investing, on the other hand, is an asset allocation strategy with low relative frictions that attempt to match or track the market return on a risk-adjusted basis. In order to effectively scrutinize the active versus passive management debate, it is therefore equally important to analyse if passive funds do indeed achieve their desired objective.

The rise of index investing and strong growth of exchange traded funds (ETFs) in recent years has particularly highlighted the growing scepticism surrounding actively managed funds in the active vs passive debate. As of 2016, net inflows of passively managed US equity mutual funds stood at just over $110 billion[4]. This compares to net outflows of actively managed US equity mutual funds of approximately $160 billion[5]. Despite this trend, empirical studies have found that the process of index tracking does not always possess a magic formula. Returning to Otten and Thevissen (2011), they found in their enhanced analysis of European mutual fund performance that passive funds perform even worse than active funds. In spite of the authors' conjecture that European passive funds in the sample are not entirely passive investors, the underperformance is however both economically and statistically significant in many cases.

Similarly, Dyck, Lins and Pomorski (2011) focus on the performance of actual passive and active equity positions in defined benefit pension plans from 1993 to 2008. Dyck et-al find that active management in emerging market equity outperforms passive strategies by 250 basis points per year or more. This result coincides with first major finding by Otten and Thevissen (2011) discussed in Section 2.3, where the benefits from active management strategies are likely to be the highest where potential competition from other sophisticated

[4] Source: WSJ – *Why Passive Investing is Overrunning Active, in Five Charts*
[5] *Ibid*

investors in the market is likely to be the lowest. Additionally, the authors report that in EAFE equities (developed markets of Europe, Australasia and the Far East), active management also outperforms passive counterparts, but only by about 50 basis points per year.

Cremers and Petajisto (2009) introduce a new measure of active portfolio management called Active Share, which represents the share of portfolio holdings that differ from the benchmark index holdings. This measure adds to the traditional measure of active management, tracking error, which puts significantly more weight on correlated active bets i.e. bets on systematic factors. Active Share on the other hand, puts equal weight on all active bets, regardless of whether the risk in such bets is largely diversified away in a portfolio. The authors find that fund performance is significantly related to Active Share, where funds with the highest Active Share outperform their benchmarks both before and after expenses, while funds with the lowest Active Share underperform after expenses.

Finally, Wermers (2003) also offers support to the value of active fund management versus passive. In his study of investment returns of shareholders in U.S. domestic equity mutual funds over a 26-year period, Wermer finds that while the majority of active funds underperform passive funds, a significant minority outperform – a positive relation between risk taken by mutual funds and the performance was discovered in six out of nine sub-periods, while S&P 500-adjusted risk was rewarded during five out of nine sub-periods. Controlling for differing exposure of funds to the market did not change the results significantly.

Despite the sustained net out flow of active mutual fund total assets over the past decade, major investment managers around the world continue to vehemently stand by their active strategies. As chairman and CEO of the world's largest asset manager, with more than $5 trillion in AUM, Larry Fink stated recently that he remains a believer in Blackrock's active management approach;

"I do not believe active is dead. We're a believer in active, and we're continuing to invest in our active portfolios"[6]

Academic proponents against active management are not of the same opinion. Martin J. Gruber (1996) is one such author that questions why actively managed mutual funds have

[6] CNBC Markets Report – CEO of world's largest asset manager: What investors are missing. 18th October 2016

grown so fast, when their performance on average has been inferior to that of index funds. Gruber believes that as the price at which funds are bought and sold is equal to net asset value and does change to reflect superior management skill, future performance is in some cases predictable from past performance. As such, a small number of sophisticated investors are able to recognize this, as witnessed by the fact that the flow of new money into and out of mutual funds follows the predictors of future performance. Gruber further questions why investment remains in funds that are predicted to do poorly and in fact do perform poorly, attributing the existence of a "disadvantaged clientele", namely unsophisticated and institutionally disadvantaged investors, to this phenomenon. Evidence that a) the flow of new money into the best performing funds is much larger than the flow of money out of the poorer performing funds and b) the stock of money is likely to contain a large percentage of funds invested by the disadvantaged clientele, are two of several reasons for this occurrence postulated by Gruber.

Lastly, Burton Malkiel (2005), one of the strongest adherents of market efficiency, also shows that actively managed mutual funds do not outperform comparable benchmark indices over a thirty year period. This finding is inclusive of domestic and international actively manged funds. In his concluding remarks, Malkiel states that the process of active stock selection accomplishes nothing but to increase transaction costs and harm performance. In essence, active equity management is a "loser's game".

As illustrated, Malkiel's above assertion is shared by a growing number academics and economic commentators in the active vs passive management debate. However, despite the respective advantages and drawbacks of each investment strategy, one cannot easily infer which approach will ultimately result in the best return to the investor. This is reflected by the large number of global investment managers adopting a blended management style, combining both active and passive investment strategies to achieve a well-balance risk adjusted portfolio.

2.4 Fund Domiciliation Decision

For the individual investor, it can be argued that the location of a particular fund may be given little to no consideration. Instead, investors rather look for indicators of performance, risk and their individual investment needs. However, for the global fund manager representing said investor, selecting the right fund domicile is a key strategic decision. As

will be illustrated in Chapter 3, this domiciliation decision can have significant implications for the fund manager in terms of taxation and litigation, regulatory conditions and fund management services and expertise. Despite its economic importance, few studies examine the behaviour of fund managers when it comes to the selection of a fund domicile. More importantly, the fund domiciliation decision and its subsequent effect on fund performance has also received minimal academic coverage.

Lang and Schäfer (2013) attempt to identify the reasons motivating fund managers to set up in one location and to avoid another. The study is based on a qualitative survey conducted in mid-2009 among 47 senior managers in the German fund sector who are responsible for the domiciliation decisions of their company. The results of the empirical study indicate that the decision of where to domicile a fund is not primarily driven by cost factors, such as registration charges and labour costs, but rather by the conditions of the approval process embedded in the legal framework and, interestingly, the quality of the workforce. It is evident from the findings that Luxembourg and Ireland are appraised to best fulfil the most important factors – 70 percent of the respondents favour both nations over other countries, while as many as 94 and 84 percent of the managers assess government support as either good or very good in Ireland and Luxembourg, respectively. The authors also attribute Luxembourg and Ireland's dominance to the first mover advantage, being the first nations to transpose UCITS[7] directives into national law.

Khorana, Servaes and Tufano (2005) similarly examine the cross-country variation in the development of fund industries from 56 countries around the world. As a prelude to their analysis, the authors note the tremendous success of both Luxembourg and Ireland, citing favourable bank secrecy and tax laws as well as an educated workforce as key drivers of this success. Given the size of the respective fund industries, the authors therefore exclude both Luxembourg and Ireland from their multivariate regressions to mitigate potentially misleading results. Consistent with Lang and Schäfer (2013), Khorana et-al conclude from their findings that strong legal and regulatory factors have a positive impact on the size of the mutual fund industry.

The above evidence suggests that there are a number of common characteristics inherent to a particular fund industry's framework which ultimately influences the domiciliation decision for mutual fund managers. The picture is less clear when it comes to the fund domicile and its

[7] Undertakings for Collective Investment in Transferable Securities – European Union directive for mutual funds

relation to performance. Ferreira, Keswani, Miguel and Ramos (2013) attempt to investigate this issue by investigating the effect of country characteristics on fund performance. In a sample of equity mutual funds from 27 countries over the 1997 – 2007 period, the authors find that there is a strong positive relation between the performance of mutual funds and a country's level of financial development. Furthermore, another interesting result is that domestic mutual funds perform better when located in countries with stronger legal institutions, better investor protection and more rigorous law enforcement. The effect of legal origin is economically strong shown by the fact that funds domiciled in countries with a common law legal origin outperform funds domiciled in countries with civil legal origin by 63 basis points per quarter.

The lack of relevant and plentiful research regarding a mutual fund's domicile and its relation to performance underscores the significant gap in existing mutual fund literature concerning this topic. This study intends to fill this gap by analysing the performance of mutual funds both domiciled and managed in Ireland.

Chapter 3 The Mutual Fund Industry – Ireland and the Rest of the World

This chapter will proceed with a concise overview of the global mutual fund industry, before switching attention to the Irish market. The latter sections of this chapter which will identify, analyse and critique the reasons as to why Ireland has become a leading international hub for fund domiciliation.

3.1 Mutual Fund Market Overview

The global asset management industry has grown to record sizes in the last number of years as international financial markets continue to gain from sustained economic recovery and central bank interventions. According to an annual survey by BCG (Boston Consulting Group), total assets under management worldwide increased to $71.4 trillion in 2015, up a staggering 66 percent since 2008[8]. This considerable rise in total AUM is similarly evident in the mutual fund industry, with worldwide assets of mutual funds standing at $42.30 trillion as of Q2 2016 up from approximately $26.2 trillion at the start of 2008[9].

Table 3.1
Worldwide number of mutual funds by region

	2007	2008	2009	2010	2011	2012	2013	2014
World	66,362	69,049	67,533	69,492	72,607	73,255	76,206	79,669
United States	8,041	8,039	7,666	7,554	7,587	7,588	7,713	7,923
Europe	35,210	36,780	34,899	35,292	35,713	34,470	34.743	35,163
Luxembourg	8,782	9,351	9,017	9,353	9,462	9,435	9,500	9,839
France	8,243	8,301	7,982	7,791	7,744	7,392	7,154	7,082
Ireland	2,898	3,097	2,721	2,899	3,085	3,167	3,345	3,462
United Kingdom	2,057	2,371	2,266	2,204	1,941	1,922	1,910	1,920
Germany	1,462	1,675	2,067	2,106	2,051	2,059	2,012	2,039

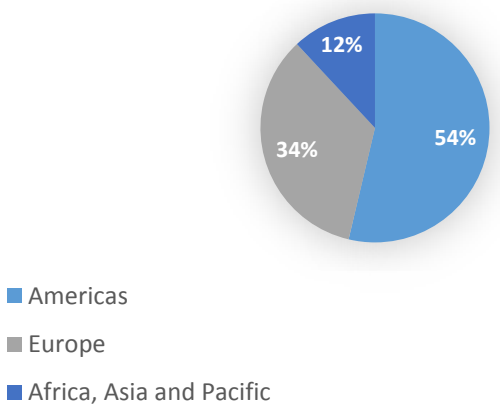
Source: ICI 2015

The popularity of mutual funds over this period can be largely explained by growing investor demand for well-diversified, liquid and customizable portfolios in the face of widespread volatility that surfaced following the 2007/08 global financial crisis. In addition, according to a study by Khorana, Serveas and Tufano (2005), the development of robust legal and regulatory factors have a positive impact on the size of the mutual fund industry, especially industry regulations addressing the process of approving fund starts, mandating fee and performance disclosures, and handling conflicts of interest between the fund management company and fund shareholders. Table 3.1 aptly demonstrates the aforementioned findings by Khorana et-al showing a 20 percent increase in the total number of mutual funds globally between 2007 and 2014. The table also includes Luxembourg, France, Ireland, the United

[8] BCG Perspectives – *Global Asset Management 2016: Doubling Down on Data.* July 11, 2016.
[9] Investment Company Institute

Kingdom and Germany, whom make up close to 70 percent of the total European mutual fund industry size. Like Ireland, Luxembourg has established itself as a hub for European cross-border asset distribution and mutual fund domiciliation by being the first EU member state to adapt its legislation to the European Directive governing UCITS. Such adaptations of legal and fiscal frameworks have facilitated the ease in which mutual funds are set up in Luxembourg, as reflected in the total number of funds registered in the above table.

Figure 3.1
Worldwide mutual funds by region

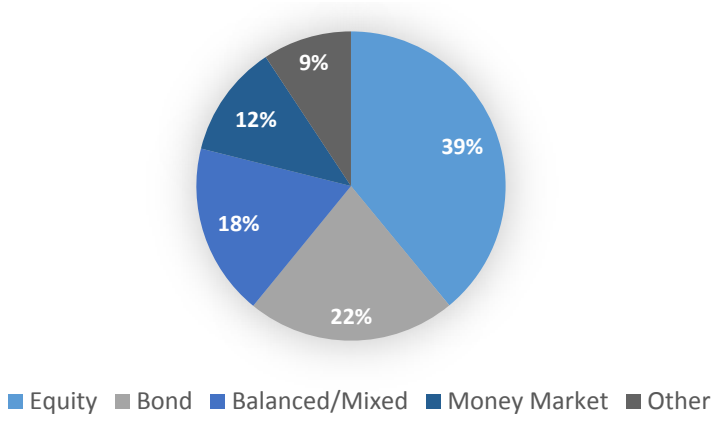


Source: ICI 2015

Figures 3.1 and 3.2 give an overview of the worldwide mutual fund assets by geographical distribution and asset type. The Americas region[10], which dominates past mutual fund research, is not surprisingly the largest mutual fund market. Europe is second holding approximately 34 percent of worldwide mutual fund assets, followed by Africa, Asia and Pacific region at 12 percent. In terms of asset allocation by fund type, the equity fund segment – which is the focus of this research – represents the largest proportion of total net asset holdings worldwide. This finding is not surprising given the lower returns and conservative nature of other asset classes in the current low interest rate environment, specifically fixed income funds – which make up 22 percent of worldwide total net assets. The remaining asset classes include balanced/mixed, money market and other (comprising of protected and real estate funds) segments.

Figure 3.2
Worldwide total net assets by type of fund

[10] United States and Canadian assets represent 94 percent of the total region



Source: ICI 2015

Focusing specifically on Europe, Table 3.2 presents further details on the size of the mutual fund industry in terms of total net assets. As of Q2 2016, the industry recorded total value of $14.3 trillion. The United States, remains however the largest mutual fund sector in the world today with 47 percent of the global total net assets (vs. 34% Europe). The table also highlights the distribution of assets between the five largest European countries in the industry, with Luxembourg again placing number one in terms of total net assets ($3.84 trillion). The primary country of focus in this research, Ireland, ranks second at $2.13 trillion total net assets – a remarkable upsurge given total net assets stood at approximately $1.009 trillion in 2007.

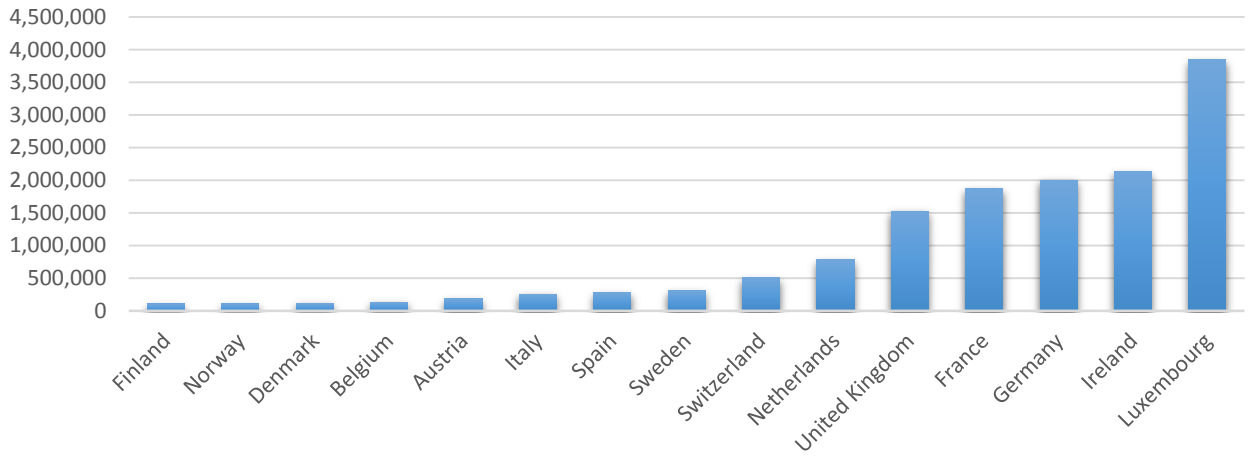
Table 3.2
Total net assets ($m) by fund type

	Total	Equity	Bond	Balanced/Mixed	Money Market	Other
World	42,307,048	16,510,379	9,250,892	7,616,638	4,995,646	3,932,386
United States	19,923,184	10,098,231	4,031,269	3,024,890	2,692,163	76,631
Europe	14,315,210	3,785,742	3,524,064	2,993,873	1,312,379	2,699,156
Luxembourg	3,843,406	1,119,389	1,198,490	847,456	312,963	365,108
Ireland	2,128,143	522,990	428,890	102,872	510,328	563,064
Germany	2,003,612	270,097	510,252	940,262	8,885	274,115
France	1,866,100	306,820	278,929	344,004	359,942	576,404
United Kingdom	1,522,253	673,281	198,495	150,957	6,602	492,917

Source: ICI 2015

Finally, Figure 3.3 offers a broader view of the European mutual fund industry by displaying the top 15 European countries by total assets. The chart exemplifies the dominance of the five aforementioned countries and the respective gap between themselves and their European counterparts.

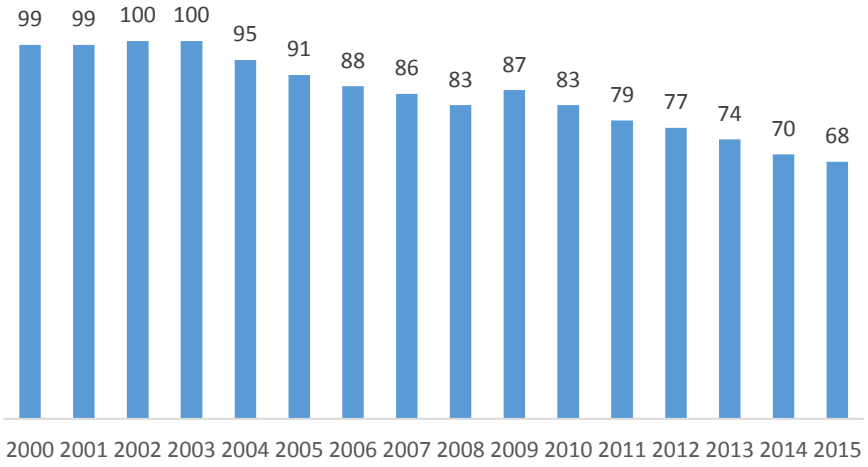
Figure 3.3
Total Net Assets – All fund types ($m)



Source: ICI 2015

Given the rapid development of the mutual fund industry in terms of the number of mutual funds, size and global distribution detailed in the above analysis, it is imperative to examine mutual fund expenses and their respective trends over the last number of years. Alongside a fund's past performance and investment objective, mutual fund expenses are very important to investors because fund operating and management fees can represent a significant drag on net returns. Using data published by the Investment Company Institute, average expense ratios incurred by mutual fund investors have fallen substantially. As shown in Figure 3.4, equity fund expense ratios stood at 99 basis points (or .99%), on average. By 2015, that average had fallen by 31 percent to 68 basis points.

Figure 3.4
Average expense ratios – Equity funds

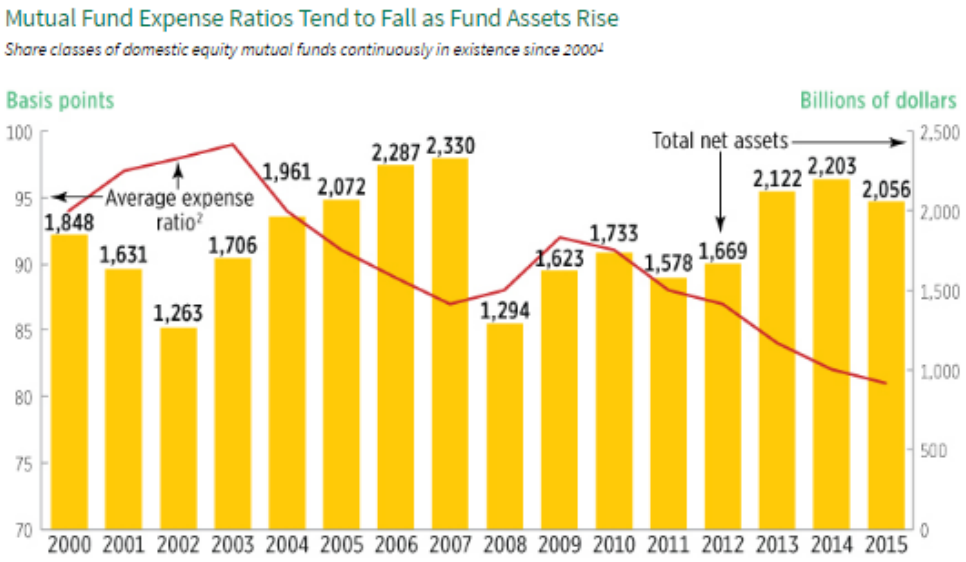


Source: ICI Fact Book 2016

There are a number of factors which help explain this gradual decline in expense ratios over the past decade and a half. Firstly, increasing competition from existing fund sponsors, new fund sponsors entering the industry and competition from alternative products such as exchange traded funds (ETFs) have significantly driven down fund expenses.

Secondly, it is often assumed that as a fund's assets grow in size, scale economies will be realized from the spreading of management and administration costs across larger asset levels. However, fund asset growth typically necessitates additional resources for portfolio management, investment research, and administration. Thus, the declining fee schedule results from anticipated efficiencies in the processes of the adviser and administrator as they add labour and capital to expand the scale of their operations. Such findings are evident in Figure 3.5, illustrating the inverse relationship between expense ratios and fund assets.

Figure 3.5
Mutual fund expense ratios and assets relation

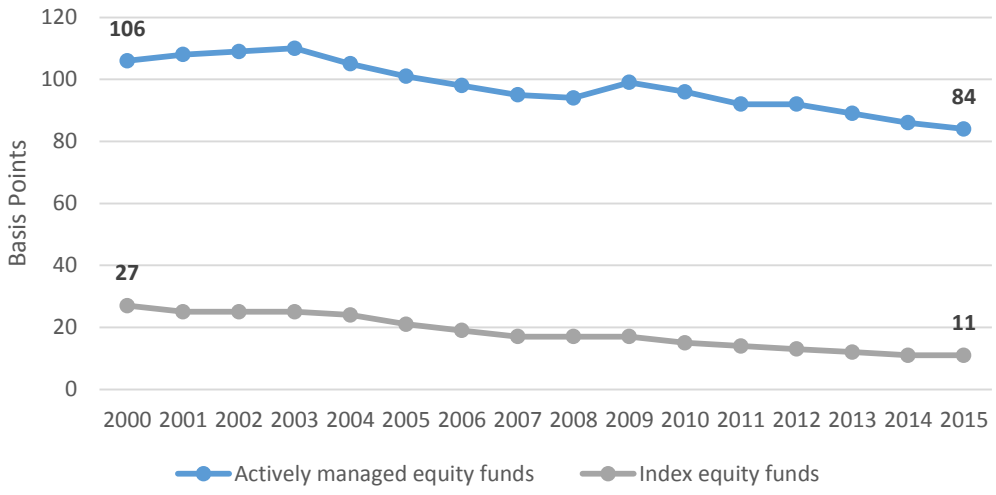


Source: ICI Fact Book 2016

Finally, the growth in investor demand for passively managed (index) funds in recent years has contributed to the noteworthy decline in fund expenses. Index equity fund assets have grown substantially, from $281 billion in 2002 to $1.79 trillion in 2015[11]. As the majority of existing empirical research suggests, the increasing inability of money managers to beat their respective benchmark indices has led to investors accelerating a shift towards passive investment strategies. In addition to the underperformance of active management strategies, investors are becoming increasingly drawn to index funds as they generally possess lower expense ratios. As shown in Figure 3.6, average index equity fund expense ratios have ranged between 27 and 11 basis points between 2000 and 2015. The corresponding expense range for actively managed equity funds is considerably higher, between 106 and 84 basis points over the same period.

Figure 3.6
Average expense ratios – Active and Index funds

[11] Investment Company Institute – 2016 Fact Book http://www.icifactbook.org/ch5/16_fb_ch5



Source: ICI Fact Book 2016

The disparity between active and passive mutual fund expenses is largely attributable to the following reasons;

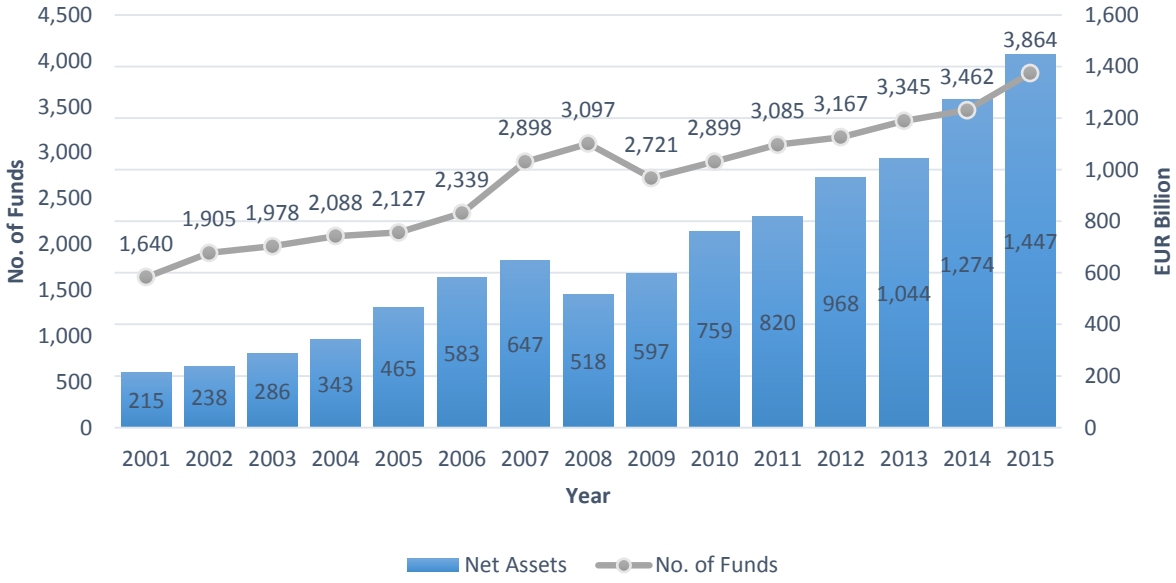
- Active investment managers generally have greater discretion to adjust their portfolio exposure, enhancing the probability of realizing superior returns.
- Active investment strategies tend to focus on stocks of varying levels of market capitalization, international regions or specialized sectors. On the other hand, the assets of passive equity funds have been heavily concentrated in "large-cap blend" funds that track large-cap indexes, which are predominantly less expensive to manage.
- Passive funds are on average larger than actively managed funds – in 2015, the average index equity fund had $5.1 billion in assets, three times the average actively managed equity fund ($1.4 billion)[12]. Hence, passive funds' expense ratios also vary inversely with fund assets with expense ratios declining via economies of scale, as previously illustrated with active mutual funds.

3.2 The Irish Mutual Fund Market

[12] Investment Company Institute – 2016 Fact Book http://www.icifactbook.org/ch5/16_fb_ch5

Over the last 20 years, Ireland has established a reputation as a leading domicile for regulated investment funds. With over $2.13 trillion[13] in mutual fund assets domiciled in Ireland, the country is currently the second largest fund domicile in Europe behind Luxembourg. As of 2015, the number of Irish domiciled mutual funds stood at 3,864, of which are distributed in over 70 countries worldwide[14]. Figure 3.7 below further illustrates the remarkable rise of the Irish mutual fund market with the number of mutual funds and total net assets[15] growing by 135.6 percent and 573 percent respectively, between 2001 and 2015.

Figure 3.7
Total assets of Irish domiciled UCITS funds



Source: Central Bank of Ireland and ICI 2015

The emergence of Ireland as an international fund domicile of choice is closely related to the successful development of the International Financial Services Centre in Dublin; and the willingness of the Irish regulatory authorities, such as the Central Bank of Ireland and the Irish Stock Exchange, to adjust and develop their regulation to keep pace with developments in the global investment funds marketplace. With regards to the former, the IFSC – which is regarded as a centre of excellence for investment funds today – was established in 1987 as a special tax zone to facilitate the development of a broad based international financial services industry, including investment fund management and administration activities[16]. As for the

[13] Investment Company Institute
[14] *Ireland – The ideal location for your funds*. PWC Ireland, 2015
[15] Net Assets of Irish Domiciled UCITS (EUR Billion) – All asset classes
[16] *Ireland as an International Fund Domicile* – Matheson, 2014

latter, Ireland was one of the first countries to implement the UCITS Directive into its national law. UCITS, or an Undertaking for Collective Investment in Transferable Securities, were created in December 1985 by a Directive of the European Union to introduce a pan-European mutual fund product. UCITS represent a significant component of a single market in financial services as investment funds can be freely marketed and sold, under the European passport, throughout the EU.

It is widely reputed that the aforementioned infrastructural, regulatory and legal developments and initiatives have profoundly shaped Ireland's financial services landscape, presenting the international mutual fund investor with an unparalleled set of attractions and advantages for fund domiciliation. The favourable tax environment is one such benefit for mutual funds domiciled in Ireland. According to PwC, Irish regulated funds are exempt from tax on investment income and gains derived from investments, while there is no net asset value tax[17]. At an investor level, non-Irish resident investors do not suffer any net asset, transfer or capital taxes on the issue, transfer or redemption of their investment units, nor are they subject to any withholding taxes on payments from the fund. Lastly, Ireland has one of the most developed tax treaty networks in the world, with a continuously expanding treaty network including over 60 countries. This arrangement is said to provide investors with the benefit of a double tax treaty between their home country and the country where the investment assets are located, therefore mitigating double tax liabilities.

With regards to the UCITS framework, the single regulatory regime for mutual funds has both reduced costs and time to market for mutual funds domiciled in Ireland. Further steps are ongoing to continuously enhance cross-border fund distribution, with Matheson forecasting further benefits passed down to investors in the form of increased efficiency and lower costs through UCITS IV[18].

Furthermore, with over 13,000 people employed in the funds industry, Ireland is continuously investing in its financial services infrastructure to meet the requirements of the most sophisticated investors. Irish-based fund managers and service providers are considered to have accumulated an unrivalled set of skills and expertise to manage and support the development of their global fund business. This is reflected by the increasing number of fund managers choosing Ireland to locate important investment management and support facilities such as fund oversight, risk management and compliance.

[17] *Ireland – The ideal location for your funds*. PWC Ireland, 2015
[18] Fourth EU Directive of its kind – set to permit fund mergers and master-feeder structures

Lastly, the above advantages are duly recognized and valued by investment managers across the globe. According an independent Economist Intelligence Unit survey commissioned by Matheson, Ireland places far ahead of its nearest rivals as the European domicile of choice for investment funds. In the survey, 71% of global asset managers said that they would now choose Ireland as one of their top-3 European fund domiciles, if starting over. Furthermore, 73% of managers ranked Ireland as a top-3 jurisdiction in terms of its legal and tax framework for investment funds, while 72% and 67% of managers ranked Ireland as a top–3 domicile as regards business conditions for domiciling funds and regulatory conditions, respectively. The business conditions considered included non-regulatory and non-tax factors such as ease of doing business, service culture and local expertise in complex products.

Chapter 4 Methodology

This chapter will proceed to elaborate the set of testable hypotheses outlined in the Chapter 1, before presenting and discussing the methodology that will be used in addressing the primary research questions of the study.

The exceptional rise in fund domiciliation and investment illustrated in the previous chapter underscores how Ireland has propelled itself to the pinnacle of the global funds industry. However, in spite of the reported lower operational costs and barriers that come with Ireland's regulatory and legal developments, the question ultimately remains whether these advantages are actually passed on to the investors in the form of lower fees, i.e. does having a fund domiciled and managed in Ireland result in risk-adjusted outperformance accordingly? If the answer is no, is there a justification for global fund managers choosing Ireland as a domicile over the domestic market? Lastly, should investors be enticed by having their funds registered in Ireland? The aforementioned questions form the underlying rationale behind this research, of which is the first of its kind to analyse both fund domicile and management location and its relation to performance in the Irish mutual fund market. As previously presented in the Introduction, the three hypotheses below are developed in addressing the primary research question;

$H1_0$: *Mutual funds domiciled and managed in Ireland have the ability to outperform their benchmark*

$H2_0$: *There is a relationship between active management and superior risk adjusted returns relative to passive management in the Irish mutual fund industry*

The first hypothesis contributes to existing literature and research on European mutual fund performance, which is yet to comprehensively measure the performance of equity mutual funds domiciled and managed in Ireland. This, in turn, adds to the growing number of studies conducted on an individual country basis, as shown in the literature review. The second hypothesis contributes to the age-old debate of active versus passive management, offering a fresh and up-to-date insight into equity mutual fund performance from an Irish perspective.

$H3_0$: *Irish based mutual fund managers do generate superior risk adjusted returns relative to the rest of the world*

The final hypothesis will seek to test the growing claim that Irish based fund managers possess world class investment management services, expertise and skills which, alongside the favourable tax, legal and administrative environment, has helped accelerate Ireland's

recognition as an international fund hub. This test will also be presented in the main section of the time series analysis which will be discussed in the proceeding chapters, using a matched sample of funds that are domiciled yet managed outside of Ireland. The results will, in turn, be compared to the primary time series analysis sample of funds both domiciled and managed in Ireland.

The above hypotheses, as well as several robustness tests, will be subsequently investigated using both single and multi-factor model methodology. Starting with the single factor model first proposed by Jensen (1986), the capital asset pricing model (CAPM) is the most recognized and commonly used single factor model in the analysis of mutual fund performance. Furthermore, the model represents one of the earliest and simplistic models to estimate the performance of a wide range of securities. The early foundations of the model, derived independently by Sharpe (1964) and Lintner (1965), imply that the expected return on any asset is equal to the risk free rate plus a risk premium given by the product of the systematic risk of the asset and the risk premium on the market portfolio, whereby the risk premium is the difference between the expected returns on the market portfolio and the risk free rate. In other words, absolute returns are assigned to a single risk-factor, known as the market return, in order to generate alpha. This alpha represents the excess or risk-adjusted return of a particular fund relative to the return of a suitable benchmark and can be determined by regressing the excess return of an equally weighted fund against the excess return of the market[19];

$$\boldsymbol{R_{it} - R_{ft} = \alpha_i + \beta_i\left(R_{mt} - R_{ft}\right) + \varepsilon_{it}} \qquad (1)$$

In this model, R_{it} represents the expected return of the fund at time t, R_{ft} is the risk free rate at time t, and R_{mt} is the market return of a suitable benchmark at time t. Finally, alpha α_i measures the risk-adjusted return of fund *i*, while β_i represents the sensitivity coefficient for excess return on the market. Emphasis here must be placed on risk-adjusted returns rather than absolute returns. Absolute (raw) returns do not accurately capture the amount of risk that was taken in order to generate said returns, which is why the proceeding analysis will focus solely on risk-adjusted measures as covered in the single and multi-factor models.

As highlighted in the literature review chapter, the alpha model has since been extended to incorporate a number of additional risk factors. Whilst the CAPM assumes that a fund's investment behaviour can be approximated using only a single market index, over the last

[19] Jensen (1968)

number decades there has been a growing number of studies which have identified several misspecifications in the single factor approach. Bhandari (1988) showed a positive connection between debt to equity and expected stock returns. Similarly, Basu (1977) found a positive connection between expected stock returns and earnings to price ratio. In a world where investment styles differ considerably in terms of asset focus and size, the aforementioned findings highlight significant shortcomings of a single factor model to explain mutual fund performance.

In response to lack of explanatory power pertaining to the CAPM, both Fama and French (1993) and Carhart (1997) aim to overcome the mentioned inadequacies by adding additional risk factors for size, book to market and momentum effects. The size effect refers to the finding that smaller companies outperform bigger companies while the book to market effect explains the potential of high book to market stocks to outperform their lower counterparts. Finally the momentum effect, also referred to as the "hot-hands" phenomenon, refers to the rationale of holding a long position in funds that showed a good performance in the previous year. The two multi-factor models are represented by the below formulas;

$$\boldsymbol{R_{it} - R_{ft} = \alpha_i + \beta_{0i}(R_{mt} - R_{ft}) + \beta_{1i}SMB_t + \beta_{2i}HML_t + \varepsilon_{it}} \quad (2)$$

$$\boldsymbol{R_{it} - R_{ft} = \alpha_i + \beta_{0i}(R_{mt} - R_{ft}) + \beta_{1i}SMB_t + \beta_{2i}HML_t + \beta_{3i}MOM_t + \varepsilon_{it}} \quad (3)$$

where SMB, HML and MOM capture the additional risk factors explained above. The exact construction of each risk factor portfolio is explained in the next chapter.

Chapter 5 Data

The following chapter will explicitly detail the data, summary statistics and benchmarks used in the analysis of the performance of equity mutual funds domiciled and managed in Ireland. This study is one of the few, if not the only, to obtain data from the financial data vendor

Bloomberg L.P. The Fund Screener command via the Bloomberg terminal offers real-time and historical financial market data on over 211,860 mutual funds worldwide, providing a user-friendly filter option for a variety of fund characteristics such as market status (i.e. active or inactive), fund asset type, manager location and profile, country of domicile, geographical focus, assets under management and fees.

The data sample for this study contains monthly data on the returns of equity mutual funds, both domiciled and managed in Ireland, over the period 2003 – 2015, resulting in a total of 155 monthly observations. The inception date of this sample period was chosen as 2003 marked the passing of a third UCITS directive, which significantly widened the range of investment possibilities for mutual funds such as money market instruments, financial derivative instruments and indices. The geographical investment focus of all funds in the sample is sixfold, with European, United Kingdom, North American, Global, Asian Pacific excluding Japan and Japan funds separated by their respective regions.

The total sample of 2,972 mutual funds domiciled and managed in Ireland was altered and finalized according to a number of criteria. Firstly, in order to mitigate against short term market fluctuations the sample is restricted to mutual funds with at least 24 months of returns data. Secondly, equity mutual funds are the sole asset class in focus with alternative investment, derivative and hybrid equity-bond funds eliminated. Thirdly, all returns are inclusive of active, inactive (dead), liquidated and merged funds. This alleviates any unwanted statistical imperfections that come with a survivorship bias sample, as discussed in the literature review. Fourth, the sample only includes funds from the six geographical investment foci regions mentioned above. Despite more than 30 different investment countries and regions being listed in the Bloomberg database, these regions represent the majority of all funds domiciled and managed in Ireland. Finally, to avoid widespread repetition of funds and assets, the sample is restricted to primary share classes of mutual funds. Primary share classes of mutual funds are commonly recognized as “A”, “B” and “C” which represent the majority of all registered mutual funds in the market. This results in a total database of 398 funds.

5.1 Summary Statistics

The total sample of 398 equity mutual funds which will be analysed in the subsequent chapters is presented in Table 5.1, alongside the absolute returns and standard deviations which pertain to a particular fund's geographical investment foci. The returns are further divided by active and passive funds in the sample which is highly necessary in investigating the multiple hypotheses illustrated in the previous chapter. The table also includes a subsample from September 2008 onwards, which will provide an interesting insight into fund performance in the post-Financial Crisis period. For the sake of simplicity, all returns are converted to US dollars to match the currency of benchmark returns used in the performance analysis (see Section 5.2). Furthermore, the returns are calculated as an equally weighted portfolio and are net of expenses.

Table 5.1 provides an early indication of the performance of the average equity mutual fund in the time-series analysis. Interestingly, all Asian Pacific ex Japan funds domiciled and managed in Ireland generated the highest annual return over the period 2003 to 2015 at 10.38 percent. Caution, however, must be placed on the significantly smaller fund sample when comparing to the other geographical foci. All European and United Kingdom funds generated an annual return of 7.93 and 7.84 percent, respectively, while North American, Global and Japanese funds show a return of 7.20, 6.22 and 5.18 percent, respectively. One must note that although these findings provide insightful information on relative fund returns across the investment foci, absolute (raw) returns are not sufficient to gauge overall performance. As such, risk adjusted returns – which will be presented in chapter six – offer a more precise measure of mutual fund performance.

The grey area surrounding the active versus passive management debate as discussed in the literature review is exemplified in the table. For European, North American, Global and Asian Pacific ex Japan investment foci, passively managed funds reported slightly better returns than their active counterparts, ranging from 0.09 to 2.39 percent. Only United Kingdom and Japanese funds reported outperformance of active funds. Despite the relatively small sample size, the large discrepancy (7.90 vs 2.69 percent) between average active and passive fund returns for UK funds domiciled and managed in Ireland is particularly striking and could possibly indicate the existence of asymmetric information available to Irish fund managers, being closest to the UK market.

Table 5.1 also reflects the importance of considering both live and dead fund returns in the analysis of mutual fund performance. If one was to only include live equity mutual funds, the

average return of all funds for each geographical investment foci would be favoured considerably. This is shown by the difference in returns between All-fund and Live Only-fund portfolios, ranging from 0.44 to 1.13 percent.

With regard to the size of the equity mutual fund, large funds have outperformed small funds for all geographical investment foci except for the United Kingdom. This finding is consistent with existing studies on mutual fund performance, including Otten and Bams (2002), who find a significantly positive relationship between the log of fund assets and risk-adjusted performance.

Finally, in the post-Financial Crisis sub-period it can be seen that European, United Kingdom and Japanese mutual funds outperform their passive counterparts, whilst the reverse is the case for North American, Global and Asian Pacific ex Japan funds. Furthermore, a survivorship bias is evident for all funds except Global and United Kingdom while there remains a large discrepancy between actively and passively managed equity UK mutual funds, as was the case in the full sample period.

Table 5.1
Summary Statistics

		2003 - 2015				2008 - 2015		
		No. of Funds	Return	St.dev	Sharpe Ratio	Return	St.dev	Sharpe Ratio
Investment Focus								
Europe								
	All	68	7.93	19.24	0.41	1.55	22.51	0.07
	Active	61	7.95	19.33	0.41	1.60	22.65	0.07
	Passive	7	8.04	18.89	0.43	1.54	21.93	0.07
	Live Only	26	8.37	20.09	0.42	1.71	23.59	0.07
	Large	34	8.74	19.96	0.44	2.88	23.51	0.12
	Small	34	7.28	18.67	0.39	0.51	21.72	0.02
United Kingdom								
	All	32	7.84	17.04	0.46	4.64	20.25	0.23
	Active	28	7.90	17.01	0.46	4.87	20.21	0.24
	Passive	4	2.69	16.86	0.16	-2.87	19.97	-0.14
	Live Only	10	8.73	24.25	0.36	3.28	28.30	0.12
	Large	16	7.85	16.89	0.46	4.48	19.98	0.22
	Small	16	8.28	17.60	0.47	5.60	21.09	0.27
N. America								
	All	93	7.20	15.12	0.48	5.23	17.78	0.29
	Active	85	7.18	15.32	0.47	5.09	18.01	0.28
	Passive	8	7.61	13.21	0.58	7.03	15.61	0.45
	Live Only	33	8.12	15.45	0.53	5.77	18.30	0.32
	Large	46	8.15	15.24	0.54	5.91	17.89	0.33
	Small	47	6.18	15.05	0.41	4.59	17.74	0.26
Global								
	All	149	6.22	15.52	0.40	2.53	18.27	0.14
	Active	135	6.10	15.53	0.39	2.50	18.30	0.14
	Passive	14	8.49	15.78	0.54	2.71	17.76	0.15
	Live Only	91	6.69	15.96	0.42	2.43	18.72	0.13
	Large	74	7.31	16.28	0.45	3.12	19.14	0.16
	Small	75	5.21	15.04	0.35	1.90	17.68	0.11
Japan								
	All	32	5.18	16.08	0.32	1.56	16.81	0.09
	Active	28	5.28	16.30	0.32	1.76	17.08	0.10
	Passive	4	4.78	15.16	0.32	0.55	15.38	0.04
	Live Only	16	6.15	15.28	0.40	3.04	16.33	0.19
	Large	16	5.62	15.74	0.36	2.18	16.51	0.13
	Small	16	4.82	16.71	0.29	1.13	17.39	0.07
Asian Pacific ex Japan								
	All	24	10.38	20.34	0.51	1.55	23.27	0.07
	Active	21	10.27	20.39	0.50	3.76	23.26	0.16
	Passive	3	10.74	20.69	0.52	3.78	23.99	0.16
	Live Only	11	11.52	20.14	0.57	4.32	23.09	0.19
	Large	12	11.53	20.02	0.58	4.40	22.99	0.19
	Small	12	8.82	20.87	0.42	2.65	23.69	0.11

5.2 Benchmarks

The CAPM (Jensen's alpha), Fama-French 3-Factor Model and the Carhart 4-Factor Model will all be utilized in the subsequent analysis of equity mutual funds domiciled and managed in Ireland. As such, benchmark data must be gathered for each of the six markets covered in the study in order to evaluate mutual fund performance using the above risk-adjusted performance measures. Two academic data sources were used in obtaining the risk factor loadings for the SMB (small minus big), HML (high minus low) and MOM (momentum) variables as well as the benchmark returns. The Fama-French 3 Factors and Momentum Factors for European, North American, Global, Japanese and Asian Pacific ex Japan markets were accessed online using the Kenneth R. French data library. This online library does not publish data on United Kingdom factors, however, Gregory, A. Tharayan, R. And Christidis, A. (2013) provide both Fama-French and Momentum portfolios and factors in the UK on the Exeter Business School website.

According to French (2012), SMB and HML portfolios are constructed by sorting stocks in a specific region into two market cap and three book-to-market (B/M) equity groups at the end of each June. Big stocks are those in the top 90% of June market capitalization for the region, and small stocks are those in the remaining 10%. The book-to-market breakpoints for a region are the 30^{th} and 70^{th} percentiles of B/M for the largest stocks of the region i.e. the top 30% of market capitalization is assigned to the high B/M portfolio and the bottom 30% is assigned to the low B/M portfolio. These portfolios are in turn used to form the SMB and HML factors using an equally-weighted average of the returns;

SMB *= 1/3(Small Value + Small Neutral + Small Growth) – 1/3(Big Value + Big Neutral + Big Growth)*

HML *= 1/2(Small Value +Big Value) – 1/2(Small Growth + Big Growth)*

The momentum factor portfolio is formed by ranking all stocks in a region by their prior (2-12) months return. The return difference between 30^{th} and 70^{th} percentile of prior (2-12) performance result in the momentum factor returns;

MOM *= 1/2(Small High + Big High) – 1/2(Small Low + Big Low)*

Table 5.2 provides the summary statistics for the different market benchmark and factor mimicking portfolios. Comparing the listed excess market returns with the average returns in Table 5.1, it can quickly be inferred that both active and passive funds domiciled and

managed in Ireland underperform the respective benchmarks in all geographical investment foci. Focusing on momentum portfolios, the strategy of avoiding losers and selecting winners offered a positive premium in all investment regions, with Asian ex Japan, European and UK regions recording particularly sizeable returns. The premium on the HML factor is also positive in each region except for UK, indicating the success of high B/M equities during the period. Furthermore, the generally low cross-correlations suggest that multicollinearity does not significantly affect the risk factor loadings obtained in the sample.

Table 5.2
Benchmark Statistics

		2003:01 - 2015:12					
				Correlations			
		Return	**St.dev**	**Market**	**SMB**	**HML**	**MOM**
Investment Focus							
Europe							
	Market - Rf	9.89	19.00	1.00			
	SMB	2.49	6.50	-0.04	1.00		
	HML	0.28	7.37	0.55	-0.03	1.00	
	MOM	8.97	13.55	-0.44	0.02	-0.44	1.00
United Kingdom							
	Market - Rf	8.55	17.34	1.00			
	SMB	4.12	15.82	0.54	1.00		
	HML	-0.79	13.37	0.76	0.67	1.00	
	MOM	7.61	16.60	0.13	0.09	0.09	1.00
N. America							
	Market - Rf	9.53	14.56	1.00			
	SMB	1.77	7.53	0.43	1.00		
	HML	0.12	7.09	0.23	0.05	1.00	
	MOM	2.03	13.55	-0.24	-0.03	-0.34	1.00
Global							
	Market - Rf	9.31	15.37	1.00			
	SMB	1.80	5.30	0.11	1.00		
	HML	1.25	5.30	0.24	-0.03	1.00	
	MOM	4.51	12.05	-0.34	0.03	-0.29	1.00
Japan							
	Market - Rf	7.34	15.41	1.00			
	SMB	3.69	9.31	-0.07	1.00		
	HML	3.47	7.69	-0.11	-0.29	1.00	
	MOM	1.16	12.52	-0.04	0.33	-0.04	1.00
Asia ex Japan							
	Market - Rf	12.95	20.52	1.00			
	SMB	-0.45	9.85	0.24	1.00		
	HML	4.25	8.94	-0.15	-0.06	1.00	
	MOM	11.90	12.84	-0.15	-0.04	-0.12	1.00

Chapter 6 Cross-Sectional Data

The previous chapter presented the mutual fund summary statistics that will be tested in the subsequent time series analysis of the thesis, illustrating the returns and standard deviations of the active, passive, live only, large and small funds in the sample. This chapter seeks to build upon the aforementioned analysis by examining and summarizing the different characteristics of the equity mutual funds both managed and domiciled in Ireland. In particular, the following sub-sections will examine the differences between active and passive mutual funds across all geographical investment foci in terms of fees and average net asset values. Furthermore, for the purpose of hypothesis three ($H3_0$) outlined in Chapter 4, the manager locations of the matched sample of funds that are domiciled yet managed outside of Ireland will be presented.

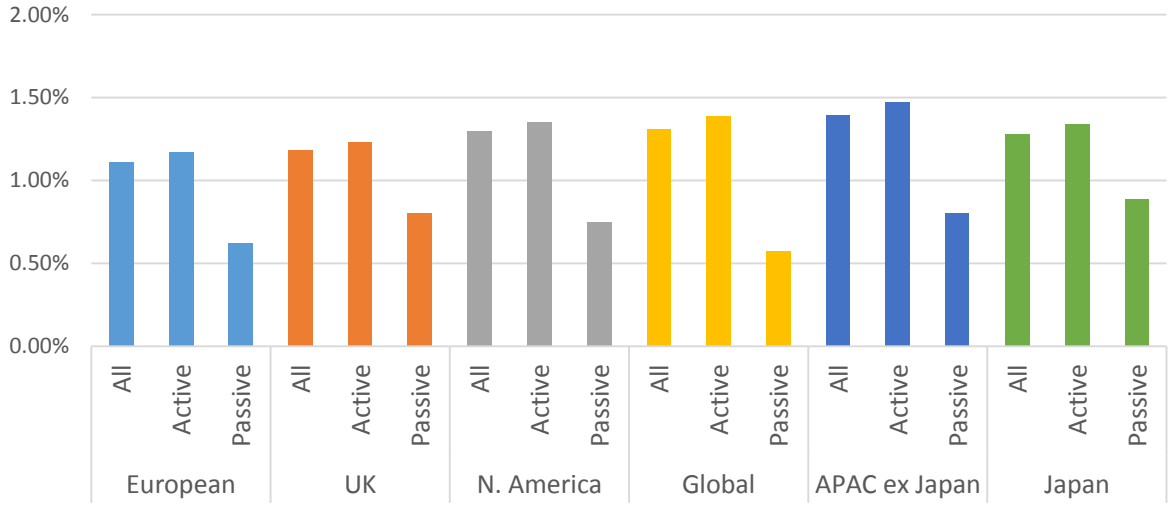
6.1 Fees & Expenses

Mutual fund fees and expenses are an extremely important component of any mutual fund performance study, particularly when analysing active funds. Actively managed mutual funds charge fees, commonly aggregated as a Total Expense Ratio (TER), based on the premise that they are able to generate a positive alpha for their investors based on their management skills and expertise. In this regard, one would expect a positive relationship between alpha and TER. However, as discussed in the literature review, studies such as Malkiel (1995), Carhart (1997) and Otten and Bams (2002) refute this claim. It is therefore imperative to examine the TER in cross-sectional analysis of this study.

According to Morningstar, the TER is the annual fee that all funds or ETFs charge their shareholders. It expresses the percentage of assets deducted each fiscal year for the fund expenses, including management fees, custodial fees, operating costs and 12b-1 fees. The management charge, which is generally the largest component of the ratio, is the fee that the fund company charges annually to manage the fund, typically in the form of commission paid to investment managers. Custody expenses arise when mutual fund companies are required to have their investments held by a custodian bank. These banks are responsible for registering the stocks, bonds, or other securities on behalf of the fund. Finally, 12b-1 fees are

taken from fund shareholders and used to promote the fund for the purpose of raising money[20].

Figure 6.1
Average TER across geographical investment foci



One limitation of the cross-sectional dataset in this study is that Bloomberg does not decompose the TER into different components described above over time. Instead, Bloomberg provides data on mutual fund TER on current (or most recent for dead funds) levels. Despite this limitation however, several important insights and conclusions can be drawn from the fees facing equity mutual funds managed and domiciled in Ireland. Figure 6.1 presents the average TER for both active and passive investment styles across the six geographical investment regions. The most interesting finding from this figure is the relative uniformity of the fee structure for all mutual funds in the sample. For all funds across the six investment regions, the average TER ranges from 1.11 to 1.39 percent per annum. The small differential is not entirely surprising however, as Ireland represents one of the most competitive fund locations in Europe – preventing other Irish fund managers from charging fees that deviate significantly from the norm. More intuitively, the average active TER is greater than the average passive TER across all geographical investment foci, with active fees ranging from 1.17 to 1.49 percent and passive ranging from 0.57 to 0.89 percent.

Given the differences in mutual fund structures across the world, the composition of fees also varies considerably. As such, Table 6.1 below the documents global mutual fund fees published by Khorana, Servaes and Tufano (2009). Even though these findings are not

[20] Source: https://www.thebalance.com/what-is-the-mutual-fund-expense-ratio-358182

incorporated into the total sample data and final alpha analysis, the table serves as an insightful and useful comparison to the Irish mutual fund cross-sectional TER breakdown displayed in Figure 6.1.

Table 6.1
TER structure around the world

	Equity
Country of Domicile	**TER**
Australia	1.17
Austria	1.47
Canada	2.56
Denmark	1.15
Finland	1.57
France	1.22
Germany	1.17
Italy	1.92
Luxembourg	1.70
Netherlands	0.64
Norway	1.97
Spain	1.58
Sweden	1.37
Switzerland	1.47
United Kingdom	1.18
United States	1.11

6.2 Assets and Flows

The broad overview of the Irish mutual fund market documented in Chapter 3 illustrated the remarkable rise of the industry not just in terms of the number of mutual funds domiciled in Ireland, but in terms of a sustained upsurge in total assets under management. This section will proceed in the same manner, using the cross-sectional data from the final sample of the thesis. In doing so, the development of average net assets for both active and passive equity mutual funds domiciled and managed in Ireland will demonstrated. It is important to highlight that this section will exclude the analysis of individual fund flows due to insufficient monthly TNA data on Bloomberg. As fund flows are calculated on a monthly basis by taking the difference in beginning and ending total net assets (TNA) that cannot be explained by the monthly total return, the inclusion of numerous gaps in monthly data may significantly distort final calculations. However, as the influence of fund characteristics on

flows will not be examined in the final time series analysis, this omission does not considerably impinge the scope of analysis presented in the thesis.

Figure 6.2 shows the average closing net assets from the period 2003 to 2015 for all equity mutual funds included in the sample. As mentioned before, the assets of active and passive funds are included together in order to gauge the relative development of each style over the sample period. Starting with active mutual funds, the average assets show a relatively stable development over the period, with the exception of a 42 percent decline from 2007 to 2008 ($333.27m vs 192.56m). This decline reveals the full extent of the Global Financial Crisis on average net assets, as numerous fund managers witnessed their portfolio values and flows shrink as the financial markets spiralled downward. However since 2008, the average closing net values of mutual funds domiciled and managed in Ireland have gradually reverted to 2007 levels, increasing by approximately 70 percent between 2008 and 2015. This revival is largely down to several rounds of quantitative easing introduced by central banks and governments around the world, in which falling interest rates stimulated a widespread "search for yield" among global investors in a low rate environment.

The most striking detail in this chart, where average net assets of passive funds significantly exceeds that of active average net assets, demands further explanation. Eight of the forty passive mutual funds domiciled and managed in Ireland in the sample are provided by The Vanguard Group. Vanguard is the second biggest investment management company in the world managing approximately $3.6 trillion in assets. More importantly, the firm is the largest provider of mutual funds and is credited as the first investment house to issue index funds to individual investors. As the original advocate of passive investing, the average net assets of these funds dramatically influences the overall averages in the sample, with net assets ranging from 1.09 to 8.6 billion dollars. As an adjustment for these outliers, Figure 6.3 illustrates the active and passive net assets managed and domiciled in Ireland with the exception of the aforementioned passive funds issued by Vanguard. In doing so, the distortion caused by the considerably larger net asset averages is minimized, offering a clearer and balanced comparison between active and passive equity mutual funds over the period. The graph reveals that active funds have higher net asset values in 8 of the 13 years in question. However from 2008, onwards passive mutual fund net assets increase at an impressive rate, growing by approximately 141 percent from 2008 to 2015 ($162.9m vs $392.5m). Such a rise is reflective of the growing consensus among academics and global

investors that active funds do not offer investors sufficient returns to justify the high fees charged, resulting in a significant shift to low cost passive funds.

Figure 6.2
Average net assets

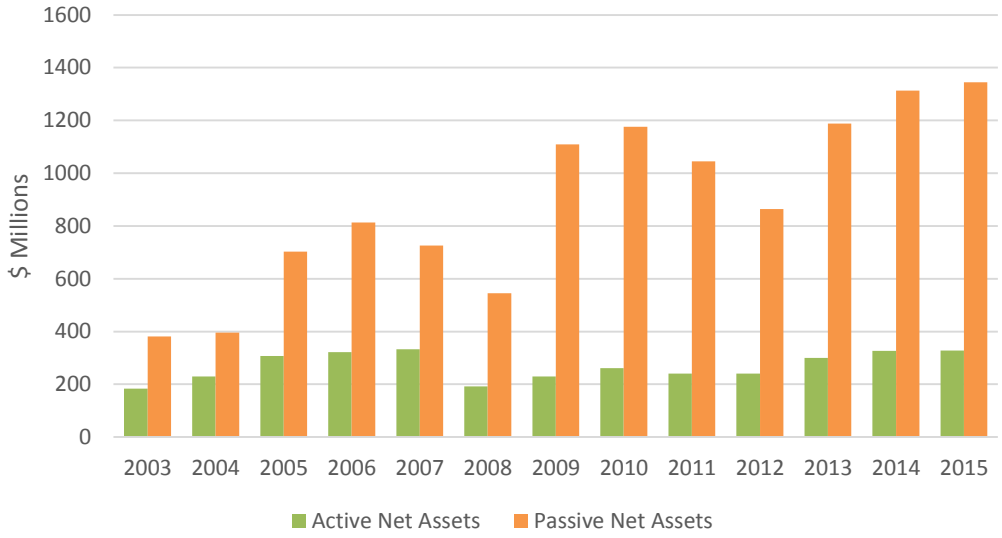
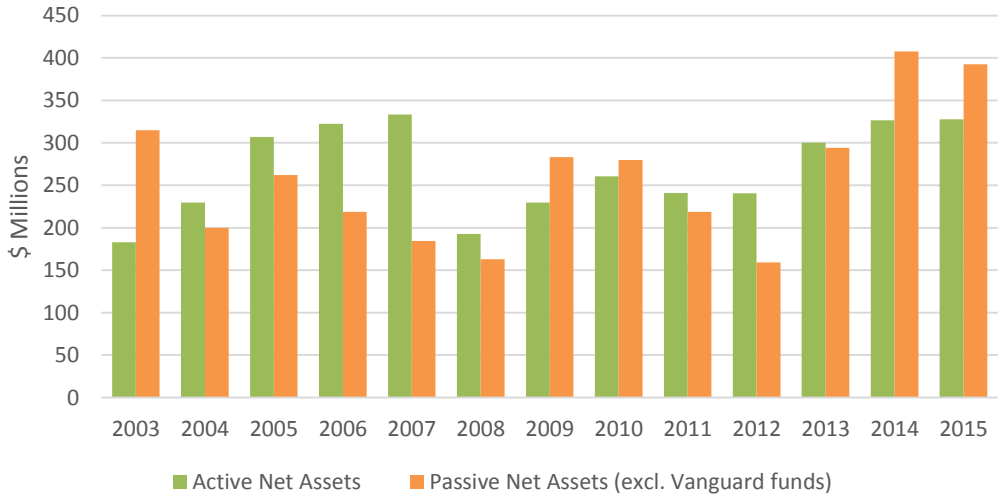


Figure 6.3
Average net assets excl. Vanguard Group funds

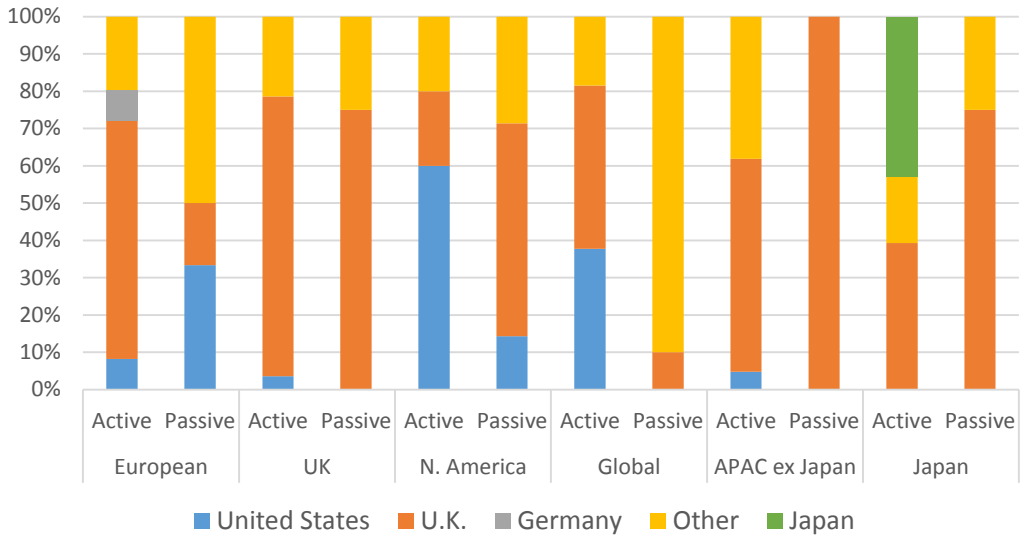


6.3 Manager Locations

As described in Chapter 4, hypothesis three of this study aims to test the growing claim that Irish based fund managers possess unrivalled investment management services, expertise and skills which, alongside the favourable tax, legal and administrative environment, has helped accelerate Ireland's position as the international fund destination of choice. As such, the

subsequent time series analysis will examine whether this reported expertise in mutual fund management, servicing and support translates to superior risk adjusted returns to investors, when compared to the rest of the world. Figure 6.4 depicts the leading foreign equity mutual fund manager locations from the matched sample of active and passive funds that are domiciled in Ireland. Given the proximity, the same language and the existence of long-lasting trade and tax partnerships, the United Kingdom is, not surprisingly, a popular fund manager location for both active and passive mutual funds domiciled in Ireland, across all geographical investment foci. United States based fund managers also feature heavily in the matched sample, managing 33 percent of the European focused passive mutual funds, 38 percent of Global active mutual funds and 60 percent of North American active funds domiciled in Ireland. Finally, "Other" fund manager locations include managers based in Hong Kong, Singapore, Australia, Canada, Switzerland and Italy, to name a few. This finding further exemplifies the global footprint of the Irish mutual fund industry in terms of domiciliation.

Figure 6.4
Fund manager locations – Outside of Ireland



6.4 Concluding Remarks

This chapter has examined the different characteristics of the equity mutual funds from both the final and matched samples of the study. Despite the mentioned limitations of the Bloomberg database in terms of publishing decomposed fees over time and comprehensive

monthly TNAs, the analysis nonetheless offers several valuable insights worth discussing. With regard to fees and expenses, it is found that the TERs of active and passive funds domiciled and managed in Ireland are relatively uniform across all geographical investment foci. Moreover, active equity mutual funds have higher TERs than their passive counterparts. The analysis of mutual fund net assets highlights the exceptional asset size of passive funds issued by the Vanguard Group, which significantly contributes to passive fund net assets exceeding active net assets for every year in the sample. Controlling for these funds allows for a concise and clearer comparison of active and passive net assets and their respective development over time. It can be observed that before the Financial Crisis, average net assets of active mutual funds exceeded that of passive funds, whilst from 2008 onward, passive fund net assets have soared at a higher rate than that of active funds. Lastly, the illustration of the different foreign manager locations of mutual funds domiciled in Ireland, which will be used in testing $\boldsymbol{H3_0}$, underscores the diverse international recognition of Ireland as a domicile for equity mutual funds.

Chapter 7 Results

The empirical results of the performance of equity mutual funds both domiciled and managed in Ireland will be presented in this chapter, as well as a thorough discussion of their implications. Specifically, the set of testable hypotheses introduced in Chapter 1 will be investigated, in addition to a number of robustness tests, in order to validate the findings. Furthermore, performance differences between active and passive mutual funds across all geographical investment foci will be analysed. In doing so, both single factor and multi factor models are utilized in the subsequent analysis of each hypotheses. As discussed in Chapter 4, the CAPM model will be extended to incorporate a number of additional risk factors such as size and value (Fama & French 1993) and momentum (Carhart 1997) in order to gauge their respective influence on risk-adjusted returns in the sample.

7.1 Single Factor Model Results

The capital asset pricing model (CAPM) is used to estimate abnormal returns for all equity mutual funds domiciled and managed in Ireland in the sample period 2003 – 2015. The funds are further separated by active and passive investment styles across each of the six geographical investment foci; European, United Kingdom, North American, Global, Japanese and Asian ex Japan. As previously mentioned, these investment regions represent the majority of all funds in the sample that are both domiciled and managed in Ireland. Benchmarks are subsequently established according to each of the aforementioned investment regions. Furthermore, a spread portfolio, which measures the difference between active and passive fund returns and the corresponding significance, is included. Table 7.1 illustrates the results of the CAPM applied to the full sample dataset.

Although estimations using the Fama-French 3-Factor and Carhart 4-Factor models will be presented in the following sections, the results from the CAPM provide a number of important insights worth discussing. Firstly, all alphas, with the exception of global passive funds, are significantly negative for all mutual funds across all geographical investment foci. Secondly, active mutual funds underperformed passive investing mutual funds across all investment regions, particularly for funds investing globally and in North America, as illustrated by the significant negative spread coefficients. Thirdly, with focus on the beta

coefficient, all mutual funds generally have sizeable exposure to the market with betas significantly ranging from 1.04 to 0.94. Caution must be placed however on the significantly lower beta of 0.89 for passive mutual funds investing in the North American market. Such discrepancies in both passive mutual funds' alpha and beta coefficients, away from zero and one respectively, will be discussed in the next section. Lastly, in terms of explanatory power, the adjusted R^2 for all funds across all investment foci is high signifying a sufficient percentage of variance explained by the CAPM.

Table 7.1
CAPM Model – Full Sample

		CAPM Model		
Investment Focus		**Alpha**	**Mkt**	**Adj R2**
Europe				
	All	-3.01***	1.00***	0.97
	Active	-3.02***	1.00***	0.97
	Passive	-2.74***	0.98***	0.97
	Spread	-0.28	0.02	0.01
United Kingdom				
	All	-2.70***	0.97***	0.97
	Active	-2.62***	0.97***	0.96
	Passive	-1.43***	1.00***	1.00
	Spread	-1.00	-0.01	-0.004
N. America				
	All	-3.56***	1.02***	0.97
	Active	-3.69***	1.03***	0.96
	Passive	-2.07***	0.89***	0.97
	Spread	-1.65*	0.14***	0.25
Global				
	All	-4.03***	1.00***	0.97
	Active	-4.15***	1.00***	0.97
	Passive	-1.73	1.04***	0.93
	Spread	-2.46**	-0.05**	0.03
Japan				
	All	-3.41***	1.02***	0.96
	Active	-3.40***	1.04***	0.96
	Passive	-3.21**	0.94***	0.91
	Spread	-0.20	0.09***	0.09
Asia ex Japan				
	All	-3.24***	0.98***	0.97
	Active	-3.34***	0.98***	0.97
	Passive	-2.98***	0.98***	0.95
	Spread	-0.37	-0.01	-0.01

Estimation of (1) for the full sample period across all geographical investment foci. All funds are separated into equally weighted portfolios of active and passive funds. The spread portfolios are constructed by subtracting active fund returns from passive fund returns. All alphas in the table are annualized. Estimates are obtained using OLS regressions.
*** Significant at the 1% level
** Significant at the 5% level
* Significant at the 10% level

7.2 Multi-Factor Model Results

Despite the sizeable explanatory power shown by the high adjusted R^2s in the previous section, it is nonetheless important to build a comparison between all three models used in this chapter. In doing so, an omitted variable test was conducted in EViews to determine the joint significance of the additional risk factors. The methodology behind this test involves taking the difference between the log likelihood values of the two different regressions (e.g. the CAPM and FF regression used to determine alpha for active European focused funds), forming a log likelihood ratio. The significance levels of the resulting log likelihood ratios are obtained from the asymptotic chi-square distribution. Table 7.2 illustrates the results of this test.

The results indicate that there is a significant improvement in explanatory power when moving from the CAPM to the Fama and French model. This is indicated by the high (and significant) Log L ratios for most funds across the geographical investment foci. The explanatory power of the FF model is similarly enhanced by the additional momentum factor in the Carhart model, although the result is not as extensive, indicative of the generally lower (and less significant) log L ratios. As a result, the following analysis will utilize both the Fama French 3-factor and Carhart models, relying to a larger degree on the former given its greater explanatory power.

Table 7.2
Model Comparisons: Explanatory Power

		CAPM		Log L Ratio	Fama & French		Log L Ratio	Carhart	
Investment Focus		**Alpha**	**Adj R2**		**Alpha**	**Adj R2**		**Alpha**	**Adj R2**
Europe									
	All	-3.01***	0.97	10.52***	-3.38***	0.97	14.86***	-4.18***	0.98
	Active	-3.02***	0.97	13.53**	-3.46***	0.97	17.45***	-4.38***	0.97
	Passive	-2.74***	0.97	5.62*	-2.57***	0.97	3.39*	-2.17**	0.97
	Spread	-0.28	0.01		-0.91	0.16		-2.25**	0.32
United Kingdom									
	All	-2.70***	0.97	32.92***	-3.05***	0.97	14.94***	-3.45***	0.97
	Active	-2.62***	0.96	35.64***	-3.02***	0.97	15.99***	-3.45***	0.97
	Passive	-1.43***	1.00	0.38	-1.42***	1.00	2.02	-1.50***	1.00
	Spread	-1.00	0.00		1.38**	0.32		-1.60***	0.33
N. America									
	All	-3.56***	0.97	32.78***	-3.68***	0.97	6.50**	-3.82***	0.97
	Active	-3.69***	0.96	35.85***	-3.81***	0.97	6.57**	-3.95***	0.97
	Passive	-2.07***	0.97	32.45***	-2.13***	0.98	0.88	-2.17***	0.98
	Spread	-1.65*	0.25		-1.71**	0.47		-1.82**	0.47
Global									
	All	-4.03***	0.97	8.65**	-4.08***	0.97	2.58	-4.27***	0.97
	Active	-4.15***	0.97	8.59**	-4.19***	0.97	1.95	-4.36***	0.97
	Passive	-1.73	0.93	2.54	-1.83	0.93	9.47***	-2.46**	0.94
	Spread	-2.46**	0.03		-2.40**	0.02		-1.94*	0.05
Japan									
	All	-3.41***	0.96	9.20***	-3.05***	0.96	0.03	-3.06***	0.96
	Active	-3.40***	0.96	10.81***	-3.14***	0.96	0.05	-3.13***	0.96
	Passive	-3.21**	0.91	17.41***	-2.24*	0.92	5.04**	-2.29*	0.92
	Spread	-0.20	0.09		-0.92	0.23		-0.86	0.25
Asia ex Japan									
	All	-3.24***	0.97	1.98	-3.40***	0.97	5.00**	-4.03***	0.97
	Active	-3.34***	0.97	2.12	-3.58***	0.97	4.24**	-4.20***	0.97
	Passive	-2.98***	0.95	30.67***	-2.37*	0.96	3.65*	-3.03**	0.96
	Spread	-0.37	-0.01		-1.24	0.16		-1.2	0.15

Estimation of (1), (2), (3) for the full sample period across all geographical investment foci. Log Likelihood ratios are calculated as the two times the difference between the log L ratios of the two models. All alphas in the table are annualized. Estimates are obtained using OLS regressions. Significance of the log L ratio is determined through a chi-square distribution.
*** Significant at the 1% level
** Significant at the 5% level
* Significant at the 10% level

Given the aforementioned significant improvement in explanatory power with the additional size, value and momentum risk factors, Table 7.3 reports the results for the Fama and French and Carhart models on the full sample. Focusing on both 3-factor and 4-factor alphas, it is evident that all funds domiciled and managed in Ireland, across the six geographical investment foci, significantly fail to beat the market. This finding is equal to that found under the CAPM model, with reported alphas significantly negative at the one percent level for all funds. The result is of enormous importance to the primary research question of this thesis. With significantly negative alphas ranging between 4.08 – 3.05 percent for FF and 4.27 –

3.06 percent for the Carhart model, mutual funds domiciled and managed in Ireland do not have the ability to outperform their benchmark. Therefore, $\boldsymbol{H1_0}$ can be rejected entirely. The results indicate that in spite of the reported lower operational costs and barriers that come with Ireland's regulatory and administrative developments – which have propelled the country's exceptional rise as a fund domicile of choice – risk-adjusted performance remains well below the respective benchmarks.

Whilst the registration of funds in countries like Ireland has proven to be performance enhancing, as shown by Ferreira, Keswani, Miguel and Ramos (2013), clear distinction must be made between performance enhancement and outperformance, with the latter assuming the primary focus of this study. The above results have shown that equity mutual funds both domiciled and managed in Ireland do not, on average, generate sufficient cost and performance advantages to render positive abnormal returns to its investors. In addition to this, the relative performance of Irish domiciled mutual funds is inferior to that of other European countries from more recent academic studies. For example, Cuthbertson and Nitzsche (2013) report an annualized 3-factor alpha of -2.39 in their study of German domiciled mutual funds, of which predominantly invest in European and Global markets. Similarly, Garcia (2012) finds that domestically focused United Kingdom mutual funds posted negative risk-adjusted in the Fama and French and Carhart factor models. The risk-adjusted returns of -0.656 and -1.402, respectively, are significantly superior to the returns of UK focused funds reported in Table 7.3.

Table 7.3 also reports the 3-factor and 4-factor estimation results for active and passive mutual funds that are domiciled and manged in Ireland. Consistent with the findings from the CAPM, active mutual funds significantly underperform passive investing mutual funds across all investment regions under the multi factor models. Furthermore, the return differences between active and passive funds, denoted by the spread portfolios, are significant[21] for United Kingdom, North American and globally focused funds under the FF model. Under the Carhart model, the spread portfolios are significant (at varying degrees), for all investment regions except Japan and Asia excl. Japan. To this end, the results indicate that there is no relationship between active management and superior risk-adjusted returns relative to passive management in the Irish mutual fund industry, leading to the rejection of the second hypothesis in this study $\boldsymbol{H2_0}$.

[21] At the 5% level of significance

Table 7.3
Multi Factor models – Full Sample

		Fama French 3-Factor Model					Carhart 4-Factor Model					
Investment Focus		**Alpha**	**Mkt**	**SMB**	**HML**	**Adj R2**	**Alpha**	**Mkt**	**SMB**	**HML**	**MOM**	**Adj R2**
Europe												
	All	-3.38***	1.00***	0.12***	-0.04	0.97	-4.18***	1.02***	0.12***	-0.002	0.08***	0.98
	Active	-3.46***	1.01***	0.14***	-0.05	0.97	-4.38***	1.03***	0.14***	0.001	0.09***	0.97
	Passive	-2.57***	0.98***	-0.09**	-0.03	0.97	-2.17**	0.98***	-0.09**	-0.047	-0.04*	0.97
	Spread	-0.91	0.03	0.23***	-0.02	0.16	-2.25**	0.05***	0.23***	0.048	0.13***	0.32
United Kingdom												
	All	-3.05***	0.96***	0.10***	-0.02	0.97	-3.45***	0.96***	0.12***	0.02	0.05***	0.97
	Active	-3.02***	0.96***	0.11***	-0.03	0.97	-3.45***	0.96***	0.13***	0.01	0.05***	0.97
	Passive	-1.42***	1.00***	-0.004	0.00	1.00	-1.50***	1.00***	-0.003	0.01	0.01	1.00
	Spread	1.38**	-0.01	0.14***	-0.03	0.32	-1.60***	-0.01	0.14***	-0.02	0.02*	0.33
N. America												
	All	-3.68***	1.02***	0.07**	-0.15***	0.97	-3.82***	1.03***	0.06**	-0.13***	0.04**	0.97
	Active	-3.81***	1.03***	0.09***	-0.16***	0.97	-3.95***	1.04***	0.09***	-0.14***	0.04**	0.97
	Passive	-2.13***	0.93***	-0.14***	-0.02	0.98	-2.17***	0.93***	-0.14***	-0.02	0.01	0.98
	Spread	-1.71**	0.10***	0.23***	-0.14***	0.47	-1.82**	0.11***	0.22***	-0.12***	0.03	0.47
Global												
	All	-4.08***	1.00***	0.07*	-0.09**	0.97	-4.27***	1.01***	0.06	-0.08*	0.03	0.97
	Active	-4.19***	1.00***	0.06	-0.09**	0.97	-4.36***	1.00***	0.06	-0.08**	0.03	0.97
	Passive	-1.83	1.05***	0.09	-0.05	0.93	-2.46**	1.07***	0.08	-0.002	0.09***	0.94
	Spread	-2.40**	-0.05**	-0.03	-0.05	0.02	-1.94*	-0.06***	-0.02	-0.08	-0.07**	0.05
Japan												
	All	-3.05***	1.02***	0.005	-0.10***	0.96	-3.06***	1.02***	0.01	-0.10***	-0.004	0.96
	Active	-3.14***	1.03***	0.03	-0.10***	0.96	-3.13***	1.03***	0.03	-0.10***	0.01	0.96
	Passive	-2.24*	0.93***	-0.16***	-0.09**	0.92	-2.29*	0.93***	-0.13***	-0.09*	-0.06**	0.92
	Spread	-0.92	0.10***	0.19***	-0.01	0.23	-0.86	0.10***	0.16***	-0.01	0.07**	0.25
Asia ex Japan												
	All	-3.40***	0.98***	-0.03	0.02	0.97	-4.03***	0.99***	-0.03	0.03	0.05**	0.97
	Active	-3.58***	0.98***	-0.02	0.04	0.97	-4.20***	0.99***	-0.02	0.05	0.05**	0.97
	Passive	-2.37*	0.99***	-0.13***	-0.18***	0.96	-3.03**	0.99***	-0.13***	-0.16***	0.05*	0.96
	Spread	-1.24	-0.004	0.11***	0.22***	0.16	-1.20	-0.004	0.11***	0.22***	-0.003	0.15

Estimation of (2) and (3) for the full sample period across all geographical investment foci. All funds are separated into equally weighted portfolios of active and passive funds. The spread portfolios are constructed by subtracting active fund returns from passive fund returns. All alphas in the table are annualized. Estimates are obtained using OLS regressions.
*** Significant at the 1% level
** Significant at the 5% level
* Significant at the 10% level

Despite the significant differences between active and passive mutual fund returns addressed in Table 7.3, greater attention must be placed on the sizeable underperformance of passive funds and, in some cases, the beta coefficients that differ significantly from unity. For example under the FF model, North American focused passive mutual funds generated a negative annualized alpha of 2.13 percent and significant beta coefficient of 0.93. Similarly European focused passive funds report a negative alpha of 2.57 percent, despite having a beta coefficient considerably closer to one. These unexpected results must be scrutinized despite their statistical significance. One may infer that the passive funds represented in the full sample are not entirely passive investors. As postulated by Otten and Thevissen (2011), the passive funds are not pure index trackers but active funds in disguise. However, in order to avoid this discrepancy and to enhance the accuracy of this study, only pure index tracking funds were selected in the formation of the passive fund portfolios across all geographical investment foci. This strict selection process allowed for the elimination of funds that, despite their "passive" classification, do not replicate an index of some sort.

With this restricted selection of index funds in the sample, the questionable results surrounding passive mutual fund returns may ultimately pertain to their respective benchmarks. In other words, the benchmarks derived from the Fama and French and Exeter Business School databases might differ substantially from the individual indexes of the passive funds. This certainly represents a reasonable assumption in the sample at hand as a large proportion of the index funds tracked industry, company and size-specific indexes. This finding does not however diminish the applicability of the benchmarks utilized in the study, with both databases offering a comprehensive representation of the six geographical investment markets. The stepwise process of assigning exact benchmarks to specific fund groups will not allow for a balanced and thorough comparison of active and passive mutual fund performances. As this is one of the main focuses in the study, rather than the performance of passive mutual funds in isolation, the quality of the overall findings presented is not undermined.

Lastly, Table 7.3 also offers important insights into the strategies adopted by active and passive mutual funds managed and domiciled in Ireland in terms of size, book to market ratio and historical performance (momentum). Starting with the size (SMB) factor, active mutual funds across European, UK and North American investment regions have an exposure to small stocks at the one percent level (in both models). Indicated by the significant positive coefficient, these active funds on average appear to have a greater risk appetite by investing

in smaller companies – a finding which is in line with existing European and US literature; Otten and Bams (2002), Carhart (1997) and Gruber (1994). Conversely, passive mutual funds show a greater exposure to larger stocks with a significant negative SMB coefficient across every investment foci except Global. The picture is less clear for the HML factor. Under the 3-factor model, active funds exhibit a significant exposure to growth stocks for funds focused in North America, Global and Japan. As for passive investing, funds focused in North America follow a more value orientated style, whilst the opposite is for Asia ex Japan funds, adopting a growth investment strategy. The fourth factor, MOM, momentum returns differ in terms of significance and sign across all investment foci.

7.3 Irish fund management vs the Rest of the World

The previous analysis on the full sample data has shown that, on average, mutual funds domiciled and managed in Ireland do not have the ability to outperform their respective benchmarks. Furthermore, it has been illustrated that there is no relationship between active management and superior risk adjusted returns relative to passive management. As highlighted in Chapter 3, Ireland has been accredited by global investors for its strong investment management services, expertise and skills which, alongside the favourable tax, legal and regulatory environment, have boosted Ireland's reputation as an international fund hub. As such, the aforementioned findings in the time series analysis certainly contradict this recognition.

However, in order to accurately critique the ability and quality of service offered by Irish fund managers it is important to analyse how they compare to the rest of the world. Using a matched sample of 398 equity mutual funds that are domiciled yet managed outside of Ireland, a clearer distinction can be drawn between Irish fund managers and their global counterparts. As outlined in Chapter 6, the location of fund managers is diverse, with fund managers situated in the United Kingdom, United States, Germany and Japan registering their funds in Ireland. The preserved focus on funds that are domiciled in Ireland in the matched sample allows for a more precise comparison of results to the findings detailed in section 7.2.

Table 7.4 reports the 3-factor and 4-factor estimation results for active and passive mutual funds that are domiciled yet manged outside of Ireland. Again, spread portfolios are included to determine whether the differences between active and passive fund returns are significant.

Comparison between Table 7.3 reveals several interesting results[22]. Firstly, as was the case in the full sample results, all funds managed outside of Ireland across the six geographical investment foci do not generate a positive risk-adjusted return (at varying degrees of significance). Focusing on the specific investment regions, actively managed funds outside of Ireland with exposure to European and United Kingdom regions performed better than those managed in Ireland. One must note that the majority of funds in the sample exposed to the UK market were actually managed by British based managers, signifying a degree of asymmetric information in the reported superior returns. Often referred to as a "home bias" phenomenon, investors' preference for domestic equities is widely evident in mutual fund studies. For example, Chan, Covrig, and Ng (2005) document the existence of home bias in every single country in their sample of 48 countries across the globe. For passive UK-focused mutual funds however, returns were superior by managers located in Ireland.

Conversely, active funds managed in Ireland that are exposed to the United States and Asian excl. Japan regions performed better than their counterparts outside of Ireland, while passive mutual fund managers outside of Ireland performed better than those based in Ireland. Lastly, both active and passive funds exposed to Global and Japanese markets managed outside of Ireland show superior returns to the same funds managed in Ireland. To this end, the results present an unclear picture as to whether the reported Irish expertise in mutual fund management, servicing and support translates to improved return to investors. Comparison between the full sample of funds (under "All Funds") domiciled and managed in Ireland with the matched sample that are domiciled yet managed outside show sporadic evidence of superior risk adjusted returns. In this regard, $\boldsymbol{H3_0}$ cannot be rejected entirely.

[22] Results are reported under both 3-Factor and 4-Factor models

Table 7.4
Mutual Funds managed outside Ireland – Matched Sample

		Fama French 3-Factor Model					Carhart 4-Factor Model					
Investment Focus		**Alpha**	**Mkt**	**SMB**	**HML**	**Adj R2**	**Alpha**	**Mkt**	**SMB**	**HML**	**MOM**	**Adj R2**
Europe												
	All	-3.07***	0.98***	0.29***	-0.10***	0.99	-3.31***	0.98***	0.29***	-0.09***	0.02	0.99
	Active	-3.08***	0.98***	0.31***	-0.11***	0.99	-3.32***	0.99***	0.31***	-0.10***	0.02	0.99
	Passive	-3.37**	0.98***	-0.14**	0.08	0.93	-3.99***	0.99***	-0.14**	0.11	0.06*	0.93
	Spread	0.30	0.00	0.46***	-0.19***	0.30	0.69	-0.01	0.46***	-0.21***	-0.04	0.30
United Kingdom												
	All	-1.35*	0.95***	0.16***	-0.07**	0.96	-1.89**	0.95***	0.19***	-0.02	0.07***	0.96
	Active	-1.16	0.94***	0.20***	-0.08**	0.95	-1.81**	0.94***	0.24***	-0.02	0.08***	0.95
	Passive	-2.05***	0.99***	-0.09***	0.00	0.98	-2.02***	0.99***	-0.09***	-0.003	-0.004	0.98
	Spread	0.91	-0.05**	0.29***	-0.08*	0.47	0.22	-0.05**	0.32***	-0.02	0.08***	0.53
N. America												
	All	-3.93***	1.02***	0.14***	-0.002	0.99	-3.84***	1.01***	0.14***	-0.02	-0.02**	0.99
	Active	-4.14***	1.02***	0.17***	-0.01	0.98	-4.05***	1.02***	0.17***	-0.02	-0.03**	0.99
	Passive	-1.74***	0.95***	-0.17***	0.05*	0.97	-1.71***	0.95***	-0.17***	0.04	-0.01	0.97
	Spread	-2.44***	0.08***	0.34***	-0.05**	0.67	-2.37***	0.07***	0.34***	-0.06**	-0.02	0.67
Global												
	All	-2.79***	0.98***	0.10***	-0.15***	0.98	-2.93***	0.98***	0.10***	-0.14***	0.02	0.98
	Active	-2.95***	0.99***	0.10***	-0.15***	0.98	-3.06***	1.00***	0.10***	-0.14***	0.02	0.98
	Passive	-1.75	0.84***	0.05	-0.10	0.87	-2.23	0.85***	0.04	-0.07	0.07*	0.87
	Spread	-1.22	0.16***	0.05	-0.05	0.21	-0.85	0.15***	0.06	-0.07	-0.05	0.22
Japan												
	All	-2.83***	1.03***	0.15***	-0.05	0.97	-2.79***	1.03***	0.13***	-0.05*	0.05***	0.97
	Active	-2.94***	1.03***	0.19***	-0.05	0.97	-2.89***	1.03***	0.16***	-0.06*	0.06***	0.97
	Passive	-1.65*	0.98***	-0.18***	-0.01	0.95	-1.67*	0.98***	-0.17***	-0.01	-0.02	0.95
	Spread	-1.31	0.05**	0.37***	-0.04	0.46	-1.24	0.05***	0.33***	-0.05	0.09***	0.50
Asia ex Japan												
	All	-4.80***	1.01***	0.09*	0.22***	0.93	-5.07***	1.01***	0.09*	0.22***	0.02	0.93
	Active	-4.97***	1.01***	0.12**	0.26***	0.92	-5.23***	1.01***	0.12**	0.26***	0.02	0.92
	Passive	-2.34***	1.02***	-0.20***	-0.22***	0.98	-2.86***	1.02***	-0.20***	-0.21***	0.04**	0.98
	Spread	-2.69	-0.01	0.32***	0.48***	0.35	-2.43	-0.02	0.32***	0.47***	-0.02	0.35

Estimation of (2) and (3) for the full sample period across all geographical investment foci in the matched sample of funds domiciled yet managed outside of Ireland . All funds are separated into equally weighted portfolios of active and passive funds. The spread portfolios are constructed by subtracting active fund returns from passive fund returns. All alphas in the table are annualized. Estimates are obtained using OLS regressions.

*** Significant at the 1% level

** Significant at the 5% level

* Significant at the 10% level

7.4 Robustness Tests

The previous analysis has established a number of significant results which, in turn, have been used in testing the previously outlined hypotheses. However in order to validate the results, a number of robustness tests will be presented in the following section. In doing so, several alterations to the multi factor models are employed. Firstly, the 3-factor model is re-estimated using the Treynor and Mazuy test, which analyses the market timing ability of fund managers. Next, the influence of fund size (correlation between size and performance) will be investigated by sub-dividing active and passive mutual funds into separate portfolios according to their NAV. Moreover, re-estimations of the models will be conducted in order to test for survivorship bias and to examine the persistence of the mutual fund returns presented in section 7.2. Lastly, the influence of fees on the performance of mutual funds domiciled and managed in Ireland is investigated by adding back the total expense ratio (TER) to fund returns.

7.4.1 Market Timing

It has been argued that the ideal fund manager should be able to predict market shifts and adjust their portfolios' composition accordingly, increasing or decreasing the risk level of their funds in bull and bear markets respectively. This is referred to as a market timing ability. In this instance, portfolio market betas tend to change in order to adjust their risk level according to market conditions. However in terms of performance analysis, the existence of precise timing adjustments of this nature would ultimately lead to an overestimation of alpha. In order to test for this potential market timing ability Treynor and Mazuy (1966) developed an extension of the CAPM model, which includes an additional quadratic factor term that reflects the convexity achieved by fund managers in their exposure to the market portfolio, $(R_{mt} - R_{ft})^2$. The subsequent analysis on the market timing of Irish fund managers applies the additional factor to the 3-factor model;

$$\boldsymbol{R_{it} - R_{ft} = \alpha_i + \beta_{0i}(R_{mt} - R_{ft}) + \beta_{1i}(R_{mt} - R_{ft})^2 + \beta_{2i}SMB_t + \beta_{3i}HML_t + \varepsilon_{it}} \quad (4)$$

where timing ability is evident if β_{1i} is positive. Conversely, Irish mutual fund managers are not able to successfully time the market if β_{1i} is negative.

Table 7.5 presents the results of the Treynor and Mazuy estimation under the 3-factor model for the full sample period. The results indicate that the vast majority of active and passive

mutual funds domiciled and managed in Ireland are (marginally) subject to mistiming, reflected by the significantly negative TM coefficient across all investment foci (except Global and North American passive funds). This finding is somewhat surprising for active mutual funds, although the findings are consistent with previous empirical studies who show evidence of significant negative timing ability (e.g. Cumby and Glen, 1990; Fletcher, 1995). Table 7.5 also offers an interesting result on the alpha coefficients from the model. According to Treynor and Mazuy (1966), a positive value for α_i suggests selectivity ability on behalf of fund managers. The results show that mutual funds domiciled and managed in Ireland demonstrated no evidence of selectivity ability, which is not entirely unexpected given the significantly negative alpha results reported in section 7.2. However, it is important to note that the majority of alphas are insignificantly different from zero which prevents the conclusion that Irish managers possess no selectivity ability on average.

Table 7.5
Treynor Mazuy Test – Full Sample

		Fama French 3-Factor Model					
Investment Focus		**Alpha**	**Mkt**	**TM**	**SMB**	**HML**	**Adj R2**
Europe							
	All	-0.92	0.99***	-0.006***	0.08**	-0.03	0.98
	Active	-0.97	1.00***	-0.006***	0.11***	-0.03	0.98
	Passive	-0.65	0.97***	-0.005***	-0.11***	-0.02	0.98
United Kingdom							
	All	-1.12	0.95***	-0.01***	0.10***	-0.02	0.98
	Active	-1.05	0.95***	-0.01***	0.11***	-0.02	0.97
	Passive	-0.53**	0.99***	-0.005***	-0.01**	-0.004	1.00
N. America							
	All	-2.00***	1.01***	-0.007***	0.07***	-0.15***	0.98
	Active	-2.04**	1.02***	-0.008***	0.10***	-0.16***	0.97
	Passive	-2.19***	0.93***	0.00	-0.14***	-0.02	0.98
Global							
	All	-2.42***	0.99***	-0.006***	0.05	-0.08**	0.98
	Active	-2.51***	0.99***	-0.007***	0.05	-0.08**	0.98
	Passive	-0.74	1.04***	-0.004	0.08	-0.04	0.94
Japan							
	All	-0.44	1.03***	-0.012***	0.04	-0.07**	0.97
	Active	-0.53	1.04***	-0.012***	0.06**	-0.07**	0.96
	Passive	-0.17	0.94***	-0.010***	-0.14***	-0.07	0.92
Asia ex Japan							
	All	-1.90*	0.97***	-0.003***	-0.04	0.03	0.97
	Active	-2.13*	0.97***	-0.003***	-0.03	0.05	0.97
	Passive	0.04	0.97***	-0.005***	-0.14***	-0.16***	0.96

Estimation of (4) for the full sample period across all geographical investment foci. All funds are separated into equally weighted portfolios of active and passive funds. TM is the Treynor-Mazuy quadratic timing coefficient. All alphas in the table are annualized. Estimates are obtained using OLS regressions.
*** Significant at the 1% level
** Significant at the 5% level
* Significant at the 10% level

7.4.2 Survivorship Bias

The full sample dataset of this study, as outlined in Chapter 5, is not subject to survivorship bias and therefore includes data from active (live), inactive and liquidated funds (dead). As such, the returns reported in the previous sections of this chapter are not overstated by the omission of dead funds. Table 7.6 nonetheless shows 3 and 4-factor alphas and R^2s for portfolios containing both live and dead-only funds (inactive and/or liquidated) across the six geographical investment foci. Spread portfolios, which provide a quantifiable measure of the survivorship bias, were constructed by taking the difference between all-fund portfolios and

live-only portfolios. The table provides a comprehensive insight into survivorship bias and how final returns can be significantly overstated when only live funds are considered. Focusing on the Carhart model, the survivorship bias ranges from -0.05 to -1.29 percent across all investment foci except Global. Moreover, under both models the spread portfolio alphas are significantly negative for Irish mutual funds with exposure to North American, Japanese and Asia excl. Japan markets. Finally, and not surprisingly, dead-only mutual funds significantly underperformed live-only mutual funds (at the 1% level) for all regions except Global; where dead funds unexpectedly outperformed their live-only counterparts, although marginally.

Table 7.6
Survivorship Bias Test – Full Sample

		Fama French 3-Factor Model					Carhart 4-Factor Model					
Investment Focus		**Alpha**	**Mkt**	**SMB**	**HML**	**Adj R2**	**Alpha**	**Mkt**	**SMB**	**HML**	**MOM**	**Adj R2**
Europe												
	All	-3.38***	1.00***	0.12***	-0.04	0.97	-4.18***	1.02***	0.12***	-0.002	0.08***	0.98
	Live	-3.42***	1.05***	0.13***	-0.02	0.98	-3.86***	1.06***	0.14***	-0.003	0.04**	0.98
	Dead	-4.72***	0.94***	0.15***	0.04	0.95	-5.63***	0.95***	0.15***	0.09*	0.09***	0.95
	Spread	0.05	-0.04***	-0.02	-0.02	0.29	-0.34	-0.04***	-0.02	0.00	0.04***	0.36
United Kingdom												
	All	-3.05***	0.96***	0.10***	-0.02	0.97	-3.45***	0.96***	0.12***	0.02	0.05***	0.97
	Live	-3.00***	1.03***	0.05***	-0.02	0.98	-3.40***	1.03***	0.07***	0.02	0.05***	0.99
	Dead	-3.47***	0.91***	0.12***	-0.03	0.95	-3.74***	0.91***	0.14***	0.00	0.03**	0.95
	Spread	-0.05	-0.06***	0.05***	0.001	0.24	-0.05	-0.06***	0.05***	0.00	0.00	0.24
N. America												
	All	-3.68***	1.02***	0.07**	-0.15***	0.97	-3.82***	1.03***	0.06**	-0.13***	0.04**	0.97
	Live	-3.06***	1.05***	0.06**	-0.14***	0.98	-3.16***	1.05***	0.06**	-0.12***	0.03**	0.98
	Dead	-3.75***	1.02***	0.06	-0.25***	0.96	-3.85***	1.02***	0.05	-0.23***	0.04**	0.96
	Spread	-0.64**	-0.02***	0.005	-0.01	0.08	-0.68**	-0.02***	0.004	-0.01	0.01	0.09
Global												
	All	-4.08***	1.00***	0.07*	-0.09**	0.97	-4.27***	1.01***	0.06	-0.08*	0.03	0.97
	Live	-3.90***	1.02***	0.09**	-0.08*	0.97	-4.28***	1.04***	0.08*	-0.05	0.06***	0.97
	Dead	-3.88***	0.97***	0.06	-0.11***	0.97	-3.90***	0.98***	0.06	-0.11***	0.003	0.97
	Spread	-0.18	-0.02***	-0.03*	-0.01	0.11	0.01	-0.03***	-0.02	-0.02	-0.03***	0.19
Japan												
	All	-3.05***	1.02***	0.005	-0.10***	0.96	-3.06***	1.02***	0.01	-0.10***	-0.004	0.96
	Live	-1.89**	0.97***	-0.01	-0.06*	0.96	-1.91**	0.97***	0.00	-0.06*	-0.02	0.96
	Dead	-5.54***	1.08***	-0.04	-0.10*	0.93	-5.47***	1.08***	-0.06	-0.11**	0.04	0.93
	Spread	-1.19**	0.05***	0.02	-0.04**	0.19	-1.17**	0.05***	0.01	-0.04**	0.02*	0.20
Asia ex Japan												
	All	-3.40***	0.98***	-0.03	0.02	0.97	-4.03***	0.99***	-0.03	0.03	0.05**	0.97
	Live	-1.84**	0.97***	-0.10***	-0.09***	0.97	-2.76***	0.98***	-0.10***	-0.08***	0.07***	0.98
	Dead	-5.08***	0.95***	0.06	0.17***	0.93	-5.53***	0.95***	0.07	0.18***	0.03	0.93
	Spread	-1.59**	0.01	0.07***	0.11***	0.22	-1.29**	0.01	0.06***	0.11***	-0.02	0.23

Estimation of (2) and (3) for the full sample period across all geographical investment foci. All funds are separated into equally weighted portfolios of live-only and dead-only funds. The spread portfolios are constructed by subtracting "Live" fund returns from "All" fund returns. The spread coefficient quantifies the survivorship bias. All alphas in the table are annualized. Estimates are obtained using OLS regressions.

*** Significant at the 1% level
** Significant at the 5% level
* Significant at the 10% level

7.4.3 Fund Size

It has been hypothesized in previous research that as a fund grows in terms of net asset size, cost advantages are subsequently realized which results in higher net returns. For example, Otten and Bams (2002) show a significantly positive relationship between the log of fund assets and risk adjusted performance, citing the existence of untapped economies of scale available in the European fund market as a potential reason for their finding. This explanation is tied to the rationale that the transaction volume is relatively higher for the larger funds, thus brokerage fees on the execution of trades are lower. In addition, the costs of access to data, research services, and support as well as administrative and overhead expenses, do not rise in direct proportion to fund size[23].

In order to investigate this phenomenon in the case for mutual funds domiciled and managed in Ireland, active and passive funds are sub-divided according to their fund size, represented by their respective net asset value (lnNAV), in each of the 6 investment foci. Spread portfolios are created to examine the difference between active and passive mutual fund returns within their asset size categories (eg High NAV active – High NAV passive). Furthermore, the High – Low portfolios effectively show whether a size effect exists for mutual fund.

Table 7.7 presents the estimation results for the different size portfolios under the 3-factor model. The results indicate that for active funds, there is positive correlation between size and performance. With the exception of UK focused mutual funds, all high-low portfolio alphas are positive, and significant for active funds exposed to North American, Japanese and Asian excl. Japan markets. For passive funds on the other hand, the results are varied with some regions reporting outperformance of large funds over small funds (Europe and Global***), while others report superior performance of small funds (North America** and Asia ex. Japan). Comparison between large and small funds pertaining to United Kingdom and Japan cannot be drawn due to insufficient monthly returns for low NAV passive funds. Finally, focusing on all funds, irrespective of their active and passive style, the relation between size and performance is to a large extent evident for mutual funds that are domiciled and managed in Ireland.

[23] Indro, Jiang, Hu, Lee (1999); *Mutual Fund Performance: Does Fund Size Matter?*

Table 7.7
Influence of Fund Size (NAV) – Full Sample

		High NAV		Low NAV		High - Low	
Investment Focus		**FF α**	**Adj R2**	**FF α**	**Adj R2**	**FF α**	**Adj R2**
Europe							
	All	-3.10***	0.98	-3.56***	0.96	0.48	0.37
	Active	-3.23***	0.97	-3.58***	0.96	0.36	0.42
	Passive	-2.42**	0.96	-3.20***	0.99	0.81	0.06
	Spread	-0.84	0.25	-0.38	0.21	-0.45	0.25
United Kingdom							
	All	-2.90***	0.97	-3.01***	0.96	0.11	0.06
	Active	-2.97***	0.97	-2.77***	0.95	-0.20	0.06
	Passive	-1.38***	0.99	N/A	N/A	N/A	N/A
	Spread	-1.38	0.30	N/A	N/A	N/A	N/A
N. America							
	All	-2.84***	0.97	-4.58***	0.97	1.83***	0.28
	Active	-2.85***	0.97	-4.71***	0.96	2.05***	0.28
	Passive	-2.65***	0.99	-1.44**	0.96	-1.23**	0.55
	Spread	-0.21	0.48	-3.42***	0.47	3.31***	0.46
Global							
	All	-3.61***	0.98	-4.62***	0.96	1.06	0.28
	Active	-3.87***	0.98	-4.60***	0.96	0.76	0.29
	Passive	-1.05	0.94	-5.70***	0.93	3.85***	0.02
	Spread	-2.85***	-0.01	1.07	0.12	-2.28	0.12
Japan							
	All	-2.09**	0.95	-4.06***	0.94	2.05*	0.11
	Active	-2.01*	0.95	-4.06***	0.94	2.13*	0.07
	Passive	-2.24*	0.92	N/A	N/A	N/A	N/A
	Spread	0.23	0.15	N/A	N/A	N/A	N/A
Asia ex Japan							
	All	-2.05**	0.98	-5.18***	0.93	3.28**	0.22
	Active	-2.07**	0.97	-5.56***	0.93	3.69***	0.23
	Passive	-2.44**	0.97	-1.19	0.84	-0.07	0.17
	Spread	0.14	0.17	-4.03*	0.17	3.58	0.07

Estimation of (2) for the full sample period across all geographical investment foci. All funds are separated into equally weighted portfolios of active and passive funds according to their size. Low NAV represents a portfolio of the lowest 50% of lnNAV funds and High NAV presents a portfolio of the highest 50% of lnNAV funds. All alphas in the table are annualized. Estimates are obtained using OLS regressions.
*** Significant at the 1% level
** Significant at the 5% level
* Significant at the 10% level

7.4.4 Evolution of Fund Performance

The negative risk-adjusted returns of equity mutual funds domiciled and managed in Ireland presented in section 7.2 depicts a fixed overview of performance in the sample period 2003 to 2015. However in order to accurately examine the evolution of fund performance over these

13 years, the sample period is divided into three sub-periods all of which are approximately equal in number of months. In addition, the sub-periods are non-overlapping. The re-estimation of mutual fund returns under segmented time periods is a useful measure of whether persistence in mutual fund performance is present in this study, where persistence refers to the hypothesis that mutual funds with an above/below average return in one period will also have an above/below average return in the next period. Table 7.8 presents the results of the 3-factor alphas and R^2s pertaining to each of the three sub-periods.

For active mutual funds the results show that all funds underperformed their respective benchmarks in each of the three sub-periods, except Japanese focused funds which outperformed the benchmark in the first sub-period (although insignificantly). In terms of performance evolution, all active funds were severely impacted during the Financial Crisis period (2007-2010), with negative significant alphas ranging from 4.50 to 6.68 percent – clear evidence for the cyclicality of funds returns in times of economic recession. Beyond 2011, all active funds improved on the previous sub-period although the risk adjusted returns remain below the benchmark. As was the case for active funds, all passive funds also underperformed their respective benchmarks in the three sub-periods for each of the six geographical investment foci. The negative (insignificant) alpha of 0.06 percent for passive funds focused globally in the crisis period represents a certain outlier in the overall findings. The performance of passive funds deteriorates from the first sub-period to the second, except for global funds – a result which is somewhat intuitive since global funds' assets are diversified across a wide range of markets which may not have been affected by the financial downturn. This intuition however does not hold for global active funds, with a significantly negative alpha of 5.46 percent.

Table 7.8
Sub-Period Analysis – Performance Persistence

		2003 - 2006		2007 - 2010		2011 - 2015	
Investment Focus		**FF α**	**Adj R2**	**FF α**	**Adj R2**	**FF α**	**Adj R2**
Europe							
	All	-2.87*	0.96	-5.65***	0.98	-2.11	0.97
	Active	-2.91	0.95	-5.63***	0.98	-2.36	0.96
	Passive	-2.25*	0.98	-5.10**	0.98	-0.49	0.97
	Spread	-0.67	0.42	-0.56	-0.02	-1.87	0.40
United Kingdom							
	All	-2.02	0.92	-4.53***	0.98	-1.48*	0.98
	Active	-2.16	0.92	-4.62***	0.98	-1.34	0.97
	Passive	-0.40***	1.00	N/A	N/A	-1.73***	0.99
	Spread	-3.43***	0.62	N/A	N/A	0.40	0.18
N. America							
	All	-1.05	0.94	-6.54***	0.98	-2.88***	0.98
	Active	-0.95	0.93	-6.68***	0.98	-2.99***	0.98
	Passive	-2.60***	0.99	-3.84***	0.98	-1.48	0.97
	Spread	1.69	0.47	-2.95	0.55	-1.53	0.52
Global							
	All	-2.49	0.92	-5.25***	0.99	-3.77***	0.97
	Active	-2.37	0.92	-5.46***	0.99	-3.80***	0.97
	Passive	-4.76	0.74	-0.06	0.97	-3.80***	0.96
	Spread	2.50	0.08	-5.40***	0.03	0.00	0.10
Japan							
	All	1.27	0.96	-5.18***	0.98	-2.53*	0.94
	Active	1.33	0.96	-5.47***	0.97	-2.40*	0.95
	Passive	-0.12	0.96	-2.23*	0.98	-3.38	0.79
	Spread	1.45	0.49	-3.31**	0.33	1.01	0.33
Asia ex Japan							
	All	-3.88*	0.91	-4.48**	0.98	-2.50**	0.98
	Active	-4.35*	0.89	-4.50**	0.98	-2.60**	0.98
	Passive	-0.69	0.94	-4.68	0.96	-1.78	0.97
	Spread	-3.69	0.19	0.19	0.11	-0.83	0.11

Estimation of (2) for the 3 non-overlapping sub-periods across all geographical investment foci. All funds are separated into equally weighted portfolios of active and passive funds. The spread portfolios are constructed by subtracting active fund returns from passive fund returns. All alphas in the table are annualized. Estimates are obtained using OLS regressions.
*** Significant at the 1% level
** Significant at the 5% level
* Significant at the 10% level

7.4.5 Gross versus Net Returns

The results presented thus far have depicted mutual fund returns net of management fees, or average total expense ratios (TERs) to be precise. These fees were illustrated in the cross

sectional analysis in Chapter 6, showing average TERs pertaining to both active and passive equity mutual funds. Given the significantly negative performance of both active and passive mutual funds domiciled and managed in Ireland reported in section 7.2, it is important to examine whether these findings still hold when returns exclude the TER i.e. when returns are adjusted gross of fees. This line of analysis will offer a robust examination of mutual fund performance in Ireland, particularly shedding light on the existence of fund manager skill (if any). If fund managers are able to outperform markets on a gross adjusted basis, one can infer that performance is negatively influenced by excessively higher fees. If however, mutual fund returns remain significantly negative throughout, question marks will certainly overshadow the viability of adept fund management in Ireland.

Table 7.9 presents the results of the re-estimated 3-factor regressions. Alphas are reported both net and gross of management fees, where gross returns include the addition of average monthly TERs at individual fund level. The gross returns show that the alphas of all funds increase across each geographical investment foci. However despite the expected improvement in reported alphas on a gross return basis, all funds remain incapable of beating the market. It is evident that mutual funds domiciled and managed in Ireland do not have the ability to outperform their benchmark gross of management fees, further reaffirming the rejection of $\boldsymbol{H1_0}$. This result is particularly striking for active mutual funds, which significantly underperformed in each of the six investment foci gross of fees. The growing case against active fund management is exemplified in these findings, as Irish fund managers (on average) appear incapable of recouping the management fees bestowed on investors through sufficient performance. Passive fund returns also remained below their respective benchmarks on a fee adjusted basis (although insignificant for global, Japanese and Asian excl. Japan funds) which again brings to light the suitability of the benchmarks utilized in the study. Overall, the findings in this section suggest that all funds domiciled and managed in Ireland are not sufficiently successful in finding and implementing new information to offset their expenses, in line with previous studies; Jensen (1968), Malkiel (1995).

Table 7.9
Influence of TERs on performance

		Gross Returns		Net Returns	
Investment Focus		**FF α**	**Adj R2**	**FF α**	**Adj R2**
Europe					
	All	-2.31***	0.97	-3.38***	0.97
	Active	-2.33**	0.97	-3.46***	0.97
	Passive	-2.12**	0.97	-2.57***	0.97
	Spread	-0.21	0.16	-0.91	0.16
United Kingdom					
	All	-1.89***	0.97	-3.05***	0.97
	Active	-1.67***	0.97	-3.02***	0.97
	Passive	-1.01***	1.00	-1.42***	1.00
	Spread	-0.44	0.36	1.38**	0.32
N. America					
	All	-2.24***	0.97	-3.68***	0.97
	Active	-2.29***	0.97	-3.81***	0.97
	Passive	-1.42**	0.98	-2.13***	0.98
	Spread	-0.89	0.49	-1.71**	0.47
Global					
	All	-2.84***	0.97	-4.08***	0.97
	Active	-2.90***	0.97	-4.19***	0.97
	Passive	-1.44	0.93	-1.83	0.93
	Spread	-1.47	0.01	-2.40**	0.02
Japan					
	All	-2.04**	0.96	-3.05***	0.96
	Active	-2.01**	0.96	-3.14***	0.96
	Passive	-1.56	0.92	-2.24*	0.92
	Spread	-0.49	0.23	-0.92	0.23
Asia ex Japan					
	All	-2.45**	0.97	-3.40***	0.97
	Active	-2.58**	0.97	-3.58***	0.97
	Passive	-1.73	0.96	-2.37*	0.96
	Spread	-0.86	0.15	-1.24	0.16

Estimation of (2) for all geographical investment foci. Average TERs are converted to monthly amounts and are added back to the net monthly returns at the individual fund level to determine gross returns. All funds are separated into equally weighted portfolios of active and passive funds. The spread portfolios are constructed by subtracting active fund returns from passive fund returns. All alphas in the table are annualized. Estimates are obtained using OLS regressions.
*** Significant at the 1% level
** Significant at the 5% level
* Significant at the 10% level

7.5 Discussion of Empirical Results

This chapter has presented the empirical results of the performance of equity mutual funds both domiciled and managed in Ireland between 2003 and 2015. Focusing exclusively on risk-adjusted returns throughout, both single and multi-factor models were employed in testing the set of hypotheses outlined in chapter three. Furthermore, performance differences between active and passive mutual funds across the six geographical investment foci was analysed.

Starting with the CAPM, the results reveal a number of important insights that are subsequently consistent with the findings estimated by the multi factor models in terms of significance and explanatory power. With the exception of global passive funds, all mutual funds reported significantly negative alphas across each geographical investment foci. Active mutual funds appear to have underperformed passive investing mutual funds across all investment regions, particularly for funds investing globally and in North America, as illustrated by the significant negative spread coefficients.

Despite the very high percentage of variance explained by the CAPM, reflected by the large adjusted R^2s, multi factor models were nonetheless utilized in order to improve the accuracy of the findings in the time series analysis. The results from the log likelihood test justify the extension of the single factor model by showing a significant improvement in explanatory power when moving from the CAPM to the Fama and French model. The explanatory power of the FF model was similarly enhanced by the additional momentum factor in the Carhart model, although the result was not as extensive, indicative of the generally lower (and less significant) log likelihood ratios.

As was the case in the CAPM, the time series regressions of the multi factor models reveal that all funds domiciled and managed in Ireland, across the six geographical investment foci, significantly fail to beat the market. As such the null hypothesis $\boldsymbol{H1_0}$ that mutual funds domiciled and managed in Ireland have the ability to outperform their benchmark was rejected entirely. In what is a major finding in the scope of the research, the alpha returns indicate that in spite of the reported lower operational costs and barriers that come with Ireland's regulatory and administrative developments – which have propelled the country's exceptional rise as a fund domicile of choice – risk-adjusted performance remained well below the respective benchmarks in each investment region.

The results from the multi factor model estimations also show that passive funds have on average higher risk-adjusted returns than their active counterparts across all investment regions, ultimately resulting in the rejection of hypothesis $\boldsymbol{H2_0}$. In this regard, one can deduce that there is no relationship between active management and superior risk-adjusted returns relative to passive management in the Irish mutual fund industry. However despite the relative superior performance, it is important to emphasize that passive mutual funds also reported negative (and significant) risk-adjusted returns. To this end, the results from this study do not comprehensively favour either investment strategy in the active versus passive management debate.

In order to test the third and final hypothesis $\boldsymbol{H3_0}$, the aforementioned full sample results were compared to multi factor model estimations using a matched sample of funds that are domiciled yet managed outside of Ireland. Despite the significantly negative risk-adjusted returns of mutual funds domiciled *and* managed in Ireland, the purpose of this analysis is to accurately critique the ability and quality of fund management service offered by Irish based managers when compared to the rest of the world. The results show only sporadic evidence of superior risk adjusted returns by Irish fund managers across the geographical investment foci relative to foreign based mutual fund managers, and as such, the hypothesis is not rejected entirely.

In the following section, a number of robustness tests were presented in order to validate the results of the primary time series analysis. In doing so, several alterations to the multi factor models were employed. In the first test, the market timing ability of Irish based fund managers is investigated by extending the 3-factor model with a quadratic factor term that reflects the convexity between benchmark and fund excess returns. On average, the majority of active and passive mutual funds domiciled and managed in Ireland are subject to mistiming, although marginally. Next, despite using a survivorship bias controlled data sample, the size of the bias is nonetheless analysed to demonstrate how final returns can be significantly overstated when only live funds are considered. The survivorship bias ranges from -0.05 to -1.29 percent across all investment foci except for Global, where dead funds surprisingly outperformed their live-only counterparts. The relation between mutual fund size and performance is also investigated by sub-dividing active and passive funds according to their size and re-estimating the 3-factor regressions. The results indicate that there is, to a large extent, a positive correlation between size and performance for mutual funds that are domiciled and managed in Ireland (especially for active funds). Furthermore, the full sample

is divided into three sub-periods to test for performance persistence in the study. A notable finding in this test is the severe negative impact the Financial Crisis period (2007-2010) had on mutual fund performance which goes against evidence of counter-cyclicality of fund returns in periods of economic distress; Moskowitz (2000), Kosowski (2001). Beyond this period, the majority of active and passive funds across the geographical investment foci improve in terms of performance, although risk-adjusted returns remain negative. Finally, unlike Otten and Bams (2002) who subsequently find positive alphas for funds after adding back management fees, it is found that mutual funds domiciled and managed in Ireland do not have the ability to outperform their benchmark gross of the total expense ratio (TER).

Chapter 8 Conclusion

This study is the first of its kind to investigate the performance of equity mutual funds that are domiciled and managed in Ireland. The country has propelled itself to the pinnacle of the international funds industry and continues to advance in terms of fund domiciliation and investment management services. However, the associated benefits that underpin Ireland's global reputation and recognition as the international domicile of choice are yet to be fully scrutinized at an investor level.

The registration of mutual funds in countries like Ireland and Luxembourg has become customary to global investment managers due to their open, transparent and well-regulated investment environments. As has been shown by Khorana, Servaes and Tufano (2005) and Land and Schäfer (2013), the decision to domicile a fund in a particular location is driven by a number of factors such as a robust legal and regulatory framework, favourable tax laws and quality of workforce. Whilst these factors have accelerated the rise of Ireland as major fund domicile, there is little academic evidence as to how these country characteristics influence mutual funds performance.

Ferreira, Keswani, Miguel and Ramos (2013) do find evidence of a strong positive relation between the performance of mutual funds and a country's level of financial development and strength of its legal institutions. However, funds domiciled in Ireland are excluded from their alpha study of 27 countries. Thus, the purpose of this study is to contribute to a more thorough understanding of the relation between fund domicile and mutual fund performance – of which represents a significant gap in academic research. In doing so, it is firstly investigated whether Irish mutual funds generate risk-adjusted returns above their respective benchmarks, given the widely acclaimed cost and service advantages. Secondly, the study contributes to the active versus passive management debate by analysing whether active mutual funds domiciled and managed in Ireland manage to outperform their passive counterparts. Finally, the acclaimed service expertise of Irish based fund managers is scrutinized, by comparing risk-adjusted returns to a matched sample of funds that are domiciled yet managed outside of Ireland.

The above questions are addressed using a survivorship bias controlled sample of 398 mutual funds domiciled and managed in Ireland from 2003 to 2015, covering six geographical investment regions; Europe, United Kingdom, North America, Global, Japan, Asian Pacific

excl. Japan. The results from both the single factor and multi factor model estimations conclusively reveal that all funds domiciled and managed in Ireland significantly underperform compared to their respective benchmarks on a risk-adjusted basis. Overall, the findings in this study are sevenfold:

1. All funds domiciled and managed in Ireland, across each of the six geographical investment foci, significantly fail to beat the market. The negative alpha returns indicate that in spite of the reported lower operational costs and barriers that come with Ireland's regulatory, legal and tax environment, risk-adjusted performance remained well below the respective benchmarks.
2. Active mutual funds significantly underperform passive mutual funds across all investment regions under both the single and multi-factor models. For certain investment foci, the return differentials significantly range from 1.60 to 2.25 percent. In this regard, one can conclude that there is no relationship between active management and superior risk-adjusted returns relative to passive management in the Irish mutual fund industry.
3. Similar to Otten and Thevissen (2011) who find statistically significant underperformance of passive funds in their sample, Irish passive mutual funds also reported significantly negative risk-adjusted returns. As such, the superior performance of passive funds domiciled and managed in Ireland must be treated with caution in the active versus passive management debate.
4. Irrespective of active and passive investment styles, mutual funds exposed to North American and Asian excl. Japan markets showed superior returns by Irish based fund managers, while funds exposed to European, United Kingdom, Global and Japanese markets show superior returns by foreign based managers.
5. In line with Cumby and Glen (1990) and Flecther (1995), the vast majority of active and passive mutual funds domiciled and managed in Ireland are subject to mistiming, although marginally.
6. Larger funds are a better investment than smaller funds, as shown by the positive correlation between size and performance of Irish mutual funds. This finding is consistent with existing studies on mutual fund performance, including Otten and Bams (2002), who find a significantly positive relationship between the log of fund assets and risk-adjusted performance.

7. Consistent with Malkiel (1995) who finds that equity mutual funds underperformed benchmark portfolios both after management expenses and gross of expenses, all funds domiciled and managed in Ireland do not have the ability to outperform their benchmark after re-estimating returns gross of management fees.

Overall, the main findings of this study are consistent with other studies that find that fund managers do not have the ability to beat the market, or even closely follow it, after fees and expenses (e.g. Sharpe (1966), Jensen (1968), Gruber (1996), Carhart (1997)). In this regard, the aforementioned results are not entirely surprising. What is surprising, however, is the magnitude of relative underperformance reported in this study, particularly when comparing Irish mutual fund performance to recent academic performance studies of other fund domiciles; Garcia (2012), Cuthbertson and Nitzsche (2013). From an investor's perspective, the results suggest that holding a passive mutual fund offers superior returns relative to active funds. Secondly, it is advisable to purchase larger funds as they also offer superior risk-adjusted performance. Ultimately however, the major findings of this study vehemently indicate that the associated legal, regulatory and tax benefits that come with holding a mutual fund domiciled and managed in Ireland are not reflected in the risk-adjusted returns.

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